City of Grand Prairie City-Wide Drainage Master Plan for Alspaugh Branch (Y#0948)

for

City of Grand Prairie

Prepared by:

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Excludes Sections VIII – XI
and Appendices D & F

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List of Acronyms

BFE	Base Flood Elevation
CBC	Concrete Box Culvert
CD	Compact Disc
CFS	Cubic Feet Per Second
CN	Curve Number
CIP	Community Infrastructure Program
CTP	Co-operating Technical Partners
DMP	Drainage Master Plan
FEMA	Federal Emergency Management Agency
FFE	Finished Floor Elevation
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FPS	Feet Per Second
FT	Feet
GIS	Geographic Information System
LF	Linear Feet
LiDAR	Light Detection and Ranging
LOS	Level of Service
NAVD	North American Vertical Datum
NCTCOG	North Central Texas Council of Governments
NRCS	Natural Resources Conservation Service
SSURGO	Soil Survey Geographic
TC	Time of Concentration
TR-55	Technical Release - 55
TxDOT	Texas Department of Transportation
USACE	U.S. Army Corps of Engineers
WSEL	Water Surface Elevation

Executive Summary

The City-Wide Drainage Master Plan for Alspaugh Branch provides comprehensive, updated technical data for the management of the Alspaugh Branch watershed. The information presented in this report will provide the City of Grand Prairie with the necessary updated drainage information to coordinate future development according to the City's drainage requirements and help minimize existing and potential flooding within the Alspaugh Branch watershed. This study is in compliance with the requirements set forth in the "City-Wide Drainage Master Plan Roadmap." The City Council of Grand Prairie passed Resolution No. _____ approving this study on _____, 2014.

The Robinson Road, Camp Wisdom East and Camp Wisdom West crossings along Alspaugh Branch are currently overtopped by the 100-year flood. Land use in watershed is currently 55% residential, **25% vacant**, 16% roadways, 3% commercial and 1% mixed use. Upstream of the Robinson Road, the watershed is primarily residential with some retail and commercial/institutional with several residential ponds. Downstream of Robinson Road, Alspaugh Branch is completely within the U.S. Army Corps of Engineers property that adjoins the Joe Pool Lake levee and dam. Dallas County owns the Camp Wisdom right-of-way and is currently planning on reconstructing Camp Wisdom and all stream crossings.

Alspaugh Branch was designated as a low priority watershed in the City-Wide Road Map due to the low occurrence of flooding/erosion issues, lack of hot spots, and the presence of relatively new development that was built after more stringent drainage development ordinances were mandated. Two improvement projects were analyzed as part of this study; however, they were not recommended after initial evaluation due to a low benefit-cost ratio.

Based on the revised mapping and flood hazard assessment, one project is recommended as part of this report. **Project 1** includes the addition of roadway signs informing drivers of the potential overtopping of the Robinson Road crossing at Alspaugh Branch. A process of assigning ranking factors was utilized to rate short-term and long-term priority projects based on criteria from Section II.G of the City of Grand Prairie City-Wide Drainage Master Plan Road Map and is described in detail in ***Section XIII*** of this report.

This report is intended to be a living document that can be updated as additional information becomes available.

Source: Aerials from City of Grand Prairie, 2013
Streets and Drainage from City of Grand Prairie, 2014

Legend

- Alspaugh Branch Centerline
- Drainage Network
- 16122 Cross Sections (white)
- Parcels requiring Elevation Certificates
- Existing 100-Year Floodplain

Number	Parcel Address	Number	Parcel Address
1	1108 Seider Lane	9	5324 Othen Drive
2	1104 Seider Lane	10	5320 Othen Drive
3	1028 Seider Lane	11	5316 Othen Drive
4	1024 Seider Lane	12	5312 Othen Drive
5	1020 Seider Lane	13	1104 Jon Paul Drive
6	1107 Seider Lane	14	5433 Avery Lane
7	1103 Seider Lane	15	5431 Avery Lane
8	1019 Seider Lane		

N

0 150 300 Feet

CITY-WIDE DRAINAGE MASTER PLAN FOR ALSPAUGH BRANCH (Y#0948)

OVERALL CIP MAP

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Date: 04/14 | Project No.: 60285901 | OVERALL CIP MAP

Short-Term & Long-Term Implementation Plan

Alspaugh Branch Watershed

	Capital Improvement Project	Project Size & Short-Term/Long-Term	Step 1 - Initial Ranking Factor - Estimate of Probable Cost vs. # Structures Benefited [1]			Step 2 - Second Ranking Factor - Cost to Benefit of Roadway Number of Citizens Impacted [2]							Step 3 - Tax Value of Benefited Property Structures [7]		Sum of 1st, 2nd, and 3rd Factors - Step 4	Initial Rank - Step 4	100-Year Ultimate Discharge at CIP Location - Step 5		Final Rank - Step 6
			# Structures	Cost	1st Factor [1]	Type	Roadway Flood Event Protection	Roadway % Citizens Protected [3]	Roadway % Citizens Impacted [4]	Roadway # Citizens Impacted [5]	Cost to Benefit Roadway # Citizens Impacted [6]	2nd Factor	Tax Value of Property Structures Benefited	3rd Factor	Total	Rank [8]	Ultimate Q_{100}	Sorting [9]	Rank [10]
1	**Project 1** - Robinson Road Crossing - Install Caution Signs	Small/Short-Term	0	$3,000	**3**	C2U	10-year	50%	50%	2730	1.099	**1**	$0	**20**	**24**	**1**	2,100	**1**	**1**

1 Refer to City-Wide Drainage Master Plan Road Map, Section II.G - Implementation Plan - Step 1
2 Refer to City-Wide Drainage Master Plan Road Map, Section II.G - Implementation Plan - Step 2
3 Based on approximation, using logarithmic chart, with 1-Year Event coverage protecting 0% of traffic volume and 100-Year Event coverage protecting 100% of traffic volume
4 Percent Impacted = 100% minus % of Roadway Citizens Protected (approximate)
5 Number Impacted = % Impacted multiplied by [No. Lanes * 4 Hours Impacted * Hourly Volume Per Lane * Level of Service "C" Traffic Volume]
6 Cost of CIP divided by Roadway # Citizens Impacted
7 Refer to City-Wide Drainage Master Plan Road Map, Section II.G - Implementation Plan - Step 3
8 Refer to City-Wide Drainage Master Plan Road Map, Section II.G - Implementation Plan - Step 4
9 Refer to City-Wide Drainage Master Plan Road Map, Section II.G - Implementation Plan - Step 5
10 Refer to City-Wide Drainage Master Plan Road Map, Section II.G - Implementation Plan - Step 6

Additional Notes:
a. Phased projects shall be ranked in order of Phasing (i.e. Phase 1 shall be ranked higher than Phase 2, etc.)

I. Introduction

I. Introduction

A. Acknowledgments

AECOM would like to acknowledge the significant contributions of all City of Grand Prairie staff in preparation of the City-Wide Drainage Master Plan. In particular, the following individuals have provided invaluable input and assistance:

Romin Khavari – City Engineer

Mazen Kawasmi - Floodplain Administrator

Chris Agnew – Drainage Engineer

Stephen Crawford – Halff Associates, Project Management Consultant

B. Purpose of Study

This study is in compliance with the requirements set forth in the "City-Wide Drainage Master Plan Road Map." The purpose of the Alspaugh Branch Drainage Master Plan is to provide comprehensive updated technical data for the management of the Alspaugh Branch watershed streams and storm water infrastructure. The information presented in this report will provide the City of Grand Prairie with the necessary updated drainage information to coordinate future development according to the City's drainage requirements and help minimize existing and potential flooding within the Alspaugh Branch watershed. The Alspaugh Branch Drainage Master Plan includes the analysis of two improvement projects in an effort to alleviate existing and potential flooding; however, neither of these projects were recommended due to their low benefit-cost ratio.

This report compiles existing and newly developed data for the Alspaugh Branch watershed into one document. This Drainage Master Plan also provides a summary of the procedures used for the technical analyses, a summary of results of these analyses, and supporting technical data and illustrative figures. The technical analyses performed include a detailed hydrologic and hydraulic study of Alspaugh Branch.

Specific objectives of the Drainage Master Plan for Alspaugh Branch:

I. Collect all relevant data, including current topographic data, project area as-builts, survey data, existing and future land use, and soils data.
II. Prepare HEC-HMS 3.5 and HEC-RAS 4.1.0 models for 2-, 5-, 10-, 25-, 50-, 100- and 500-year existing storm events, along with the 100-year ultimate storm event and perform a roadway crossing evaluation for all crossings along Alspaugh Branch in the project area.
III. Prepare pre-design estimates of probable construction costs for the conceptual alternative improvements.

C. City Ordinances and Development Requirements

As part of the City-Wide Drainage Master Plan study, the City's Drainage Design Manual (DDM) and existing development requirements were reviewed to determine their adequacy to prevent future flooding and erosion issues. Several areas along the Alspaugh Branch watershed are fully developed at this time with some pockets still vacant for future development.

The City of Grand Prairie is especially progressive in their storm water management program. The City's DDM was updated as recently as July 2013 and is intended to "…protect the general health, safety, and welfare of the public by reducing flooding potential, controlling excessive runoff, minimizing erosion and siltation problems, and eliminating damage to public facilities resulting from uncontrolled storm water runoff."

Articles 14 and 15 of the Unified Development Code, included in the City's DDM, contain the City ordinances for Drainage and Floodplain Management, respectively. Requirements include the elevation of new construction to a minimum of one foot above the ultimate 100-year floodplain or two feet above the existing conditions100-year floodplain, whichever is higher. Construction of detention basins is required when downstream facilities are not adequately sized to convey a design storm based on current City criteria for hydraulic capacity. Post project peak flows are not allowed to exceed the existing condition peak flows unless sufficient downstream capacity above existing discharge conditions is available. When required, detention facilities are to be designed such that peak discharges or velocities are not increased when compared to pre-project conditions for the 2-, 10-, and 100-year floods.

The City ordinances allow for responsible development of the watershed such that flood risks to future structures can be minimized. The ordinances also allow for protection of existing structures so that future development will not increase the flooding hazard in areas that do not have the capacity to convey increased flood discharges. Upon review of the City's DDM and existing development requirements, it has been determined that the requirements in combination with the technical data provided in the report are adequate to properly manage the watershed going forward.

D. Watershed Description

The Alspaugh Branch (FEMA Stream 8C6) study area is located in Grand Prairie, Dallas County, Texas (***Appendix A - Figure 1***). The Alspaugh Branch watershed is located north of Joe Pool Lake and south of Interstate 20, bounded by Crestview Drive to the west, and Mountain Creek to the east. The watershed has a total area of approximately 1,065 acres (1.66 square miles) and drains generally from west to east through a series of storm drains, ponds, culverts and open channels until it reaches the limits of the study, at its confluence with Mountain Creek (***Appendix A - Figure 2***). The modeled reach of Alspaugh Branch extends approximately 11,720 feet (2.22 miles), from just downstream of the detention pond at Prairie Lane to its confluence with Mountain Creek. The Alspaugh Branch watershed continues upstream (west) from its modeled extents approximately 2.1 miles, through a series of storm drains and inter-connected neighborhood detention ponds.

Based on existing land use, the watershed was found to be mainly residential, with scattered vacant, commercial, and open areas (***Appendix A - Figure 3***). The portion of the watershed upstream of Robinson Road is predominantly residential lots with some vacant areas zoned for future commercial development. The future land use (***Appendix A - Figure 4***) shows the majority of these vacant lots as a residential classification with some commercial near the intersection of Camp Wisdom and Lake Ridge Parkway. The open space land will remain the same in the foreseeable future since it is owned by the USACE.

D.1 Major Streams and Tributaries

The watershed consists of approximately 11,720 linear feet of Alspaugh Branch and no other significant streams or tributaries. Alspaugh Branch is designated as a limited detail 100-year flood hazard zone (A) from its confluence with Mountain Creek to Camp Wisdom Road and a detailed 100-year flood hazard zone (AE) between the two Camp Wisdom crossings according to the FEMA FIRM Panels 0270L and 0290L, Dallas County and Incorporated Areas effective August 23, 2001. Alspaugh Branch is not currently mapped upstream of the west crossing of Camp Wisdom Road.

D.2 Unique Attributes of Watershed

The Alspaugh Branch watershed has two retention ponds within the upper limits of the watershed which are hydraulically interconnected. The storm drain connecting the retention ponds, approximately 3,660 feet in length, receives flow from nearby drainage systems and conveys the flow from the upstream retention pond (Lake Parks retention Pond) to the downstream retention pond (Lakewood retention Pond). The connecting storm drain varies in size from a 6-foot by 5-foot box at the upstream end to two 9-foot by 5-foot boxes at the downstream end.

E. Principal Flooding Problems

In the late 1990s-early 2000's, a majority of the Alspaugh Branch watershed began its transition from an agricultural land use to the largely residential area it is today. In accordance with the City's revised drainage ordinances for new development, residential ponds were required to mitigate the increased runoff from any new development during this period. There are four residential detention/retention ponds in the upstream residential portions of Alspaugh Branch which help to mitigate the increased flows from the residential developments. A majority of the downstream portion of Alspaugh Branch is located within the USACE property classified as open space; therefore, there are no structures that are at risk of flooding downstream of the Robinson Road crossing.

E.1 Hot Spot Locations

Two hot spot locations were identified as part of this analysis. The first hot spot identified was the potential flooding of the residential pond located in Lakewood neighborhood located southeast of the intersection of Camp Wisdom Road and Prairie Lane. The second hot spot identified was the crossing of Alspaugh Branch at Robinson Road. This roadway is shown to overtop during the existing 25-year storm event.

F. Pertinent Study and Technical Data Related to Watershed Prior to Alspaugh Branch Master Plan Preparation

F.1 Existing Data

I. *Alspaugh Branch Master Drainage Plan – Kimley Horn (May 2002)*

The purpose of this study was to evaluate existing and fully developed flooding hazards in the Alspaugh Branch watershed and to develop an overall Master Drainage Plan for the watershed. All major crossings are overtopped by fully developed discharges and the recommendations include culvert improvements or raising road profiles.

II. *Alspaugh Branch Master Drainage Plan –UPDATE – Kimley Horn (April 2003)*

The purpose of this report was to properly account for developments in the western end of the watershed that were not proposed when the Alspaugh Master Drainage Plan was published. The results were similar to before, and recommendations included culvert improvements or raising road profiles.

III. *Alspaugh Branch current effective FEMA hydraulic HEC-2 model (February 1982)*

The HEC-2 model for Alspaugh Branch was obtained from the U.S. Army Corps of Engineers (USACE).

II. Hydrologic Studies

AECOM Technical Services, Inc.

City-Wide Drainage Master Plan for Alspaugh Branch (Y#0948)

II. Hydrologic Studies

A. General

A hydrologic analysis was conducted by AECOM for the Alspaugh Branch watershed utilizing the USACE HEC-HMS (Version 3.5) and the Bentley PondPack v8i computer programs. As described in ***Section II.J***, the PondPack software was used to capture the effect of the two interconnected residential retention ponds on the hydrology of the watershed. The hydrologic models were developed for both existing and ultimate (i.e., fully developed) hydrologic conditions.

Drainage boundaries were delineated based on 2009 City of Grand Prairie 1-foot contours and available City storm drain information. All drainage boundaries were verified during AECOM's field reconnaissance trip on March 6, 2013. The overall drainage area map is shown in ***Appendix A - Figure 2***.

The 2-, 5-, 10-, 25-, 50-, 100- and 500-year existing storm events, along with the 100-year ultimate storm event, were developed and analyzed for this study. AECOM utilized the detailed watershed delineation, existing and future land use determinations, and the hydrologic soil coverage to develop the HEC-HMS model for the Alspaugh Branch watershed. The City of Grand Prairie DDM (July 2013) along with Urban Hydrology for Small Watersheds, Technical Release 55 (TR-55) were used as guidelines for the hydrologic analysis.

B. Watershed

Alspaugh Branch is a tributary to Mountain Creek located in Grand Prairie, Texas, originating at the Lakewood retention Pond, located at Camp Wisdom and Prairie Lane, and generally flowing eastward before Its confluence with Mountain Creek, approximately 600 feet southeast of the Camp Wisdom Road East crossing. The watershed has a total area of approximately 1,065 acres (1.66 square miles). The upstream limits of the watershed begin in the neighborhood on the east side of Lake Ridge Parkway, south of Camp Wisdom Drive, and the watershed extends eastward toward Mountain Creek.

The upstream portion of Alspaugh Branch, from Lakewood retention Pond to the Robinson Road crossing is through mostly open land with few trees. The downstream segment, from Robinson Road to the confluence with Mountain Creek, is within the US Army Corps of Engineers (USACE) and Federal land, and is mostly dense, natural vegetation.

For this study, the Alspaugh Branch watershed was divided into 26 total subbasins. Watershed characteristics such as drainage area (***Appendix A - Figure 2***), land use (***Appendix A - Figures 3 & 4***), soil type (***Appendix A - Figure 5***), and time of concentration were determined for each subbasin.

C. Land Use

Existing

Existing land use for Alspaugh Branch was provided by the City of Grand Prairie, based on their 2009 zoning. Based on the existing land use, the watershed was found to be approximately 55% residential, 25% vacant, 16% roadways, 3% commercial and 1% mixed use. Upstream of Robinson Road, the watershed consists of mostly residential development with some scattered vacant lots. The watershed downstream of Robinson Road is generally residential development or vacant/open land. ***Appendix A - Figure 3*** illustrates the existing conditions land use for the Alspaugh Branch watershed.

Future

Future land use for Alspaugh was provided by the City of Grand Prairie and was based on the 2009 zoning maps. Based on the future land use the watershed will be approximately 57% residential, 23% vacant, 16% roadways, 3% commercial and 1% mixed use. ***Appendix A - Figure 4*** illustrates the anticipated future conditions land use for the Alspaugh Branch watershed.

D. Impervious Coverage

Percent impervious is a function of the various land uses within a watershed. The *City of Grand Prairie Drainage Design Manual Volume 2 (July 2013), Table 4.1C* was used as a guide to assign percent impervious values to specific land use areas. Each project parcel was assigned a land use type and a corresponding percent impervious was assigned to that parcel. A composite percent impervious was computed for each of the 26 subbasins for both existing and ultimate conditions.

E. Soil Types

The NRCS SURGO database was used to calculate the curve number for each subbasin. The project area is almost entirely Hydrologic Soil Type D, with a very small portion of Type B soils found south of Camp Wisdom near the confluence with Mountain Creek. The hydrologic soils for the Alspaugh Branch watershed are shown in ***Appendix A - Figure 5****.*

The antecedent moisture condition (AMC) defines the soil moisture condition prior to a storm. AMC-II was used in this study for the average soil moisture conditions.

F. Loss Rates

The Curve Number Loss methodology developed by the NRCS was used to estimate infiltration losses. Curve numbers were computed based on a composite percentage of soil types within each subbasin. Group B soils were assigned a curve number of 61 and Group D soils were assigned a curve number of 80 based on *TR-55 Table 2.2c*, for pasture, grassland, or range for good hydrologic condition.

The above discussed hydrologic parameters were computed for existing and ultimate conditions and can be found in ***Table IV.1***.

G. Unit Hydrograph Methodology

The NRCS Unit Hydrograph methodology was used to develop lag times for each subbasin. The time of concentration for each of the 26 subbasins was calculated using the Grand Prairie Drainage Design guidelines for overland (sheet) flow and shallow concentrated flow and an assumed velocity of six feet per second (fps) for channelized flow. The TC calculations can be found in Appendix B.

H. Rainfall

As per the DDM, the frequency storm distribution methodology for rainfall is preferable when using the NRCS unit hydrograph methodology for hydrologic modeling; however, this was not feasible for this Study. The use of two different hydrologic modeling packages (PondPack for upstream and HEC-HMS for downstream) reduced the number of rainfall methodologies common to both softwares. As a result, the NRCS Type II 24-hour rainfall methodology was used for the 2-, 5-, 10-, 25-, 50-, 100-, and 500-year storm events. The 24-hour storm totals required for this methodology were taken from Table 5.4 (Depth-Duration Data) of the City of Grand Prairie DDM.

I. Flood Routing

Modified-Puls and Muskingum-Cunge routing methods were used to establish storage-outflow relationships based on steady state HEC-RAS analyses developed for Alspaugh Branch. A multi-profile HEC-RAS 4.1.0 run was created for existing conditions, and the results from this run were used to develop storage-outflow relationships for the Modified-Puls routing reaches along Alspaugh Branch. The Muskingum-Cunge method was used to account for channel storage in the creek running along the north side of the Joe Pool Lake levee. To determine the 8-point typical cross-section for the Muskingum-Cunge method, the 1-foot contours used for the channel geometry since the creek is trapezoidal in nature and fairly consistent in size throughout the reach.

J. Interconnected Ponds Modeling

The Alspaugh Branch watershed study includes the modeling of two interconnected retention ponds, Lake Parks retention Pond (upstream) and Lakewood retention Pond (downstream). These retention ponds are interconnected by approximately 3,660 feet of concrete box culverts (CBC) which range from 6'x5' to 2-9'x5' in size (***Appendix A – Figure 2***). Preliminary modeling in HEC-HMS showed that the backwater from the Lakewood retention Pond is affecting the Lake Parks retention Pond discharge for larger storm events. PondPack V8i was selected to model the interconnected ponds since HEC-HMS cannot adequately model such conditions. PondPack is also a FEMA-accepted hydrologic software that has similar capabilities to HEC-HMS for hydrologic modeling of subbasins using standard NRCS Curve Number methodology. Therefore, the Alspaugh Branch watershed was split into two separate hydrologic models: the upstream PondPack model, and the downstream HEC-HMS model. The HEC-HMS model begins at the weir outfall of the downstream Lakewood retention Pond which is also the upstream limit of the HEC-RAS hydraulic model.

Elevation-storage curves for the two interconnected ponds were created based on the 2009 City of Grand Prairie 1-foot contours. The outfall structure for the upstream pond (Lake Parks retention Pond) was created based on field survey data (flowlines) provided by the City and measurements (height, width, depth) taken by AECOM in a field reconnaissance visit performed on May 17, 2013. The interconnecting culverts between the two ponds were modeled as a single 6'x5' CBC for the entire 3,660 feet length. This was done to assume inlet conditions on the upstream Lake Parks retention Pond while allowing for backwater from the downstream Lakewood retention Pond to interact freely with the upstream pond. The weir outfall structure for the downstream Lakewood retention pond was created based on field survey and surrounding contours. The downstream boundary condition for the PondPack model was set as a free outfall. PondPack would not allow for the use of a rating curve as a downstream boundary condition for higher elevations which caused the outfalls of both the Lake Parks retention Pond and Lakewood retention Pond to be submerged at the same time

As shown in ***Appendix A - Figure 2***, drainage areas A-09 and A-10 discharge into the interconnecting culvert between the two ponds. Since PondPack does not allow additional flow between interconnected ponds, an engineering assumption was made on the discharge locations of the drainage areas in the model. Both drainage areas were modeled as discharging to the downstream Lakewood retention Pond, since the time to peak for these drainage areas was found to occur at least 14 minutes before the upstream Lake Parks retention Pond reached its maximum stage for the 100-year storm event.

III. Hydraulic Studies

AECOM Technical Services, Inc.

City-Wide Drainage Master Plan for Alspaugh Branch (Y#0948)

III. Hydraulic Studies

A. Hydraulic Analyses

The hydraulic analysis for the study was performed using HEC-RAS v4.1.0. This program determines the water surface elevations (WSELs) based on geometric characteristics along the stream. The geometric characteristics include cross sections, channel length, channel slope, and Manning's n-values. An existing conditions HEC-RAS model was developed and existing and ultimate flows were run through the model.

Cross sections were placed where hydraulic changes occurred in the system and at the upstream and downstream faces of hydraulic structures. Cross sections were cut from the 2009 City-Wide 1-foot contour data using HEC-GeoRAS 10. These cross sections were supplemented with field survey data provided by the City. Cross section locations are displayed in ***Appendix A - Figure 6*****.**

Manning's n-values were assigned to each cross section based on AECOM's field reconnaissance, 2009 aerial photos, and digital photos provided by the City. For modeling purposes, it was assumed that all culvert structures had no sediment or debris accumulation during a flood event.

The Modified-Puls routing method was used to account for storage in the floodplain along Alspaugh Branch and its corresponding effect on hydrograph timing and peak discharge. ***Appendix A – Figure 2*** shows the analysis points along the creek.

The downstream boundary conditions for the model are based on the Mountain Creek WSELs for the 10-, 50-, 100-, and 500-year storm events from a nearby FEMA analysis point and extrapolated using a logarithmic scale for the 2-, 5-, and 25-year storm events. Computed peak discharges from the hydrologic models for the 2-, 5-, 10-, 25-, 50-, 100- , and 500-year frequency floods along with the 100-year ultimate storm event were entered into the HEC-RAS hydraulic model. A DVD containing all hydrologic and hydraulic models used in the study is included with this report in ***Appendix* G**.

IV. Hydrologic and Hydraulic Study Results

AECOM Technical Services, Inc.

City-Wide Drainage Master Plan for Alspaugh Branch (Y#0948)

IV. Hydrologic and Hydraulic Study Results

A. Hydrologic Study Results

AECOM prepared a detailed HEC-HMS hydrologic model for the Alspaugh Branch watershed to analyze the watershed conditions for the 2-, 5-, 10-, 25-, 50-, 100- , and 500-year frequency storm events along with the 100-year ultimate storm event. The Modified-Puls storage routing method was used to account for attenuation of flow in Alspaugh Branch.

Table IV-1 is a list of computed hydrologic parameters including drainage areas, lag times, composite curve numbers, and percent impervious for existing and ultimate conditions.

Table IV-1 - Subbasin Characteristics

Subbasin	Drainage Area (ac.)	Existing Lag Time (min.)	Ultimate Lag Time (min.)	Composite Curve Number	Existing % Impervious	Ultimate % Impervious
PondPack						
A-1	129	14.33	14.33	80	40.23	48.96
A-2	15	6.42	6.42	80	50.13	50.13
A-3	13	5.33	5.33	80	56.88	56.88
A-4	33	11.76	9.26	80	46.72	66.77
A-5	20	7.05	7.05	80	50.17	50.17
A-6	27	9.32	8.19	80	55.47	61.13
A-7	26	3.64	3.64	80	48.37	48.37
A-8	64	9.77	9.77	80	65.11	65.11
A-9	59	16.26	15.59	80	45.05	67.64
A-10	90	15.23	15.23	80	43.96	51.64
A-11	37	11.17	11.17	80	67.71	68.39
A-12	67	26.76	26.76	80	27.75	31.84
A-13	11	7.29	7.29	80	71.32	71.32
HEC-HMS						
A-14	28	9.91	9.91	80	61.51	61.51
A-15	22	9.04	9.04	80	71.21	71.21
A-16	17	10.10	10.10	80	59.70	59.72
A-17	17	7.36	7.36	80	49.57	50.00
A-18A	14	14.10	14.10	80	38.64	62.22
A-18B	26	21.78	16.10	80	24.68	48.76
A-19A	95	18.73	18.73	80	17.91	17.91
A-19B	65	17.60	17.60	80	3.43	4.08
A-20	104	22.98	18.46	80	9.15	22.15
A-21	27	7.54	7.54	80	53.34	64.40
A-22	20	6.21	6.21	80	23.49	23.96
A-23	28	12.76	12.76	80	43.85	45.53
A-24	11	8.90	8.90	76	19.36	19.36

A complete summary of calculated discharges for existing and ultimate conditions is shown in ***Table IV-2***. ***Appendix A - Figure 2*** can be referenced for subbasin and analysis point locations corresponding to the ones used in the tables. A copy of the HEC-HMS results is located in ***Appendix C.1***.

Table IV-2 - Existing and Ultimate Discharges

Analysis Point	Description	Contributing Drainage Area (sq. mi.)	Peak Discharge (cfs)							
			2-yr (EX)	5-yr (EX)	10-yr (EX)	25-yr (EX)	50-yr (EX)	100-yr (EX)	500-yr (EX)	100-yr (ULT)
J-1	Lakewood Detention Pond Outfall	0.92	400	620	815	1,110	1,430	1,880	3,280	1,970
J-2	Storm Drain Outfall	1.00	425	660	870	1,180	1,520	1,960	3,400	2,050
J-3	Storm Drain Outfall	1.03	265	660	870	1,180	1,550	1,990	3,450	2,080
J-4	Robinson Road Crossing	1.05	315	665	860	1,170*	1,560	2,010	3,470	2,100
J-5	Storm Drain Outfall	1.07	350	675	875	1,190	1,590	2,040	3,520	2,130
J-6	DA-18B Segment	1.12	385	725	915	1,250	1,680	2,140	3,670	2,230
J-7	Drainage Area 19 Outfall Structure	1.37	555	1,115	1,370	1,720	2,340	2,890	4,700	2,990
J-8	DA-20 Segment	1.53	695	1,265	1,615	1,980	2,590	3,180	5,180	3,290
J-9	Camp Wisdom West Crossing	1.57	680	1,220*	1,575	2,020	2,600	3,210	5,220	3,310
J-10	DA-22 Segment	1.60	675	1,215	1,565	1,990	2,590	3,180	5,080	3,280
J-11	DA-23 Segment	1.65	685	1,225	1,580	2,010	2,610	3,200	5,130	3,300
J-12	Camp Wisdom East Crossing	1.65	680*	1,220	1,575	2,000	2,610	3,190	5,120	3,300
Outfall	Confluence with Mountain Creek	1.66	680	1,225	1,580	2,010	2,610	3,200	5,130	3,300

*Smallest storm event overtopping crossing (represented by shaded cell)

The difference in flows from existing to ultimate conditions is primarily due to anticipated development within the watershed. There is an increase in percent impervious and a reduction in lag times (***Table IV-1***), resulting in larger ultimate conditions flows. As can be seen in ***Table IV-2***, the increases are not significant.

B. Hydraulic Study Results

The HEC-RAS hydraulic model of Alspaugh Branch and the City of Grand Prairie 2009 1-foot contour data were used to delineate the 100-year existing and ultimate floodplains. The floodplains were delineated using RASMapper and manually altered in areas with available field survey data. The delineations of the existing and ultimate 100-year floodplains are illustrated in the Topographic Work Map (***Appendix A - Figure 6***). Flood profiles of Alspaugh Branch for the for the 2-, 5-, 10-, 25-, 50-, 100- and 500-year existing storm events, along with the 100-year ultimate storm event are provided for existing conditions in ***Appendix A - Figure 7***. HEC-RAS output files of Alspaugh Branch for the for 2-, 5-, 10-, 25-, 50-, 100- and 500-year existing storm events, along with the 100-year ultimate storm event, are provided in ***Appendix C.2.***

The hydraulic results indicate that the ultimate 100-year flood elevations are slightly higher than the existing 100-year flood elevations. The average increase is approximately 0.11 feet, with the maximum increase of 0.42 feet occurring at the downstream confluence with Mountain Creek.

C. Validation of Hydraulic Results at Camp Wisdom West Gage

The City of Grand Prairie has a network of 14 gages (precipitation and stream) that collect data at roadway crossings and report to the base station every 5 minutes. The data for sensors 6160 (precipitation) and 6163 (stage) at the Camp Wisdom West crossing was obtained for the life of the gage (March 2009 – December 2013). The data was examined for large storm events that produced 24-hour precipitation more than the 1-year, 24-hour rainfall intensities in Table 5.4B– Depth-Duration Data of the City of Grand Prairie's DDM. Two storm events, a September 12-13, 2009 storm event and Tropical Storm Hermine (September 7-8, 2010), met this criteria and were further evaluated.

For these storm events 1-, 2-, 3-, 6-, 12-, and 24-hour maximum precipitation totals were obtained and compared to Table 5.4 – Depth-Duration Data of the City of Grand Prairie's DDM. The results are shown below in ***Table IV-3***.

Table IV-3 - Gage Data Frequency Analysis

Storm Duration	Table 5.4 Standard Storm Depth Values			September 12-13, 2009 Storm	Tropical Storm Hermine (Sept. 7-8, 2010)
	1-year	2-year	5-year		
1-hr	1.49	1.85	2.45	0.72	0.88
2-hr	1.81	2.22	3.00	1.12	1.24
3-hr	1.99	2.45	3.30	1.48	1.88
6-hr	2.41	2.91	3.90	2.32	3.00
12-hr	2.80	3.45	4.70	3.60	4.76
24-hr	3.21	3.95	5.40	4.44	5.00

Orange Cells represent the September 2009 storm event and the closest match to a standard storm depth value.
Purple Cells represent Tropical Storm Hermine and the closest match to a standard storm depth value.
Cells with red outline represent closest match to standard storm depth value for a 24-hour duration.

The highlighted cells with the red borders in ***Table IV-3*** shows that the September 2009 storm was similar to the 2-year, 24-hour standard storm event and that Tropical Storm Hermine was closer to a 5-year, 24-hour standard storm event. Based on this, the HEC-RAS model WSELs at the downstream cross-section 4161 (since the gage sensors are located on the downstream face) were compared to the peak stage reported by the gage sensor 6163 and it was found that for the September 2009 storm, the modeled WSEL for the 2-year storm at RS 4161 was 0.05 feet higher than the peak stage (489.84 feet) reported at the gage. For Tropical Storm Hermine, the 5-year

WSEL at RS 4161 was 0.24 feet higher than the peak stage (490.11 feet) at the gage. The relatively close match for both storms showed that the AECOM model for Alspaugh Branch validates closely with the best available gage data at the Camp Wisdom West crossing.

D. Quality Assurance / Quality Control

Quality assurance / quality control for the hydrologic and hydraulic studies was performed by a third party reviewer (Halff Associates) in March 2013 and June 2013. All comments were satisfactorily addressed prior to preparing the final existing conditions model. The QA/QC comments and responses are included in ***Appendix E.2*** of this report.

V. Floodplain Mapping

AECOM Technical Services, Inc.

City-Wide Drainage Master Plan for Alspaugh Branch (Y#0948)

V. Floodplain Mapping

As part of the City-Wide Drainage Master Plan for Alspaugh Branch, AECOM was contracted to map Alspaugh Branch using the City of Grand Prairie 2009 LIDAR data and supplementary field survey data. The existing and ultimate 100-year floodplains prepared for Alspaugh Branch, as part of this drainage master plan, can be found in ***Appendix A - Figures 6a & 6b***.

The floodplain for Alspaugh Branch was delineated using HEC-GeoRAS. The mapping extents were checked against the hydraulic model's water surface extents. The cross sections on the maps match those in the hydraulic model. BFEs were generated based on the hydraulic model output and placed at major inflection points along the stream. Alspaugh Branch ties into the preliminary effective flood boundaries near the Camp Wisdom Road west crossing.

VI. Roadway Crossings

VI. Roadway Crossings

A. Evaluation of Existing Roadway Crossings

AECOM performed a Roadway Crossing Evaluation (***Appendix E.1***) for Alspaugh Branch. The 2-, 5-, 10-, 25-, 50-, 100-, and 500-year frequency storm events along with the 100-year ultimate storm event were evaluated to determine the level of protection at each roadway crossing. It was determined that the Robinson Road crossing along Alspaugh Branch was unable to pass the 25-year storm event, the Camp Wisdom West crossing was unable to pass the 5-year storm event and the East Camp Wisdom crossing was unable to pass the 2-year storm event as shown in ***Figure VI-1***.

The Robinson Road crossing is currently 2-7'x6' CBC's and will be overtopped by the 25-year and larger storm events. The Camp Wisdom Road West crossing is currently 2-8'x5' CBC's and will be overtopped by the 5-year and larger storm events. The Camp Wisdom Road East crossing is currently 2-7'x6' CBC's and is unable to pass the full 2-year event; however, flow is lost over the east bank of the stream to Mountain Creek and the crossing is able to pass the partial flow for all storm events. Pertinent hydraulic data for existing and ultimate conditions for each crossing can found in ***Table VI-1***.

Table VI-1 – Roadway Crossing Summary

Crossing	Description	Upstream River Station	Upstream Flow Line Elevation (ft)	Minimum Overtopping Elevation (ft)	Existing 100-yr WSEL at US Face (ft)	Ultimate 100-yr WSEL at US Face (ft)	Flood Frequency Protection
Robinson Road	2-6'x6' CBC	9548	512.31	523.75	525.56	525.63	10-year
Camp Wisdom West	2-8'x5' CBC	4211	486.94	496.39	498.44	498.50	2-year
Camp Wisdom East	2-7'x6' CBC	1124	465.31	470.00	470.61	470.63	<2-year*

*Roadway is not overtopped at crossing. Flow is lost to the Mountain Creek floodplain to the east.

B. Evaluation of Proposed and Future Roadway Crossings

The Robinson Road crossing is currently overtopped by the existing 25-year storm event and will require significant changes to provide a higher level of flood protection. Currently, Robinson Road dead-ends in to the Joe Pool Lake levee less than 500 feet south of the crossing. In the event of flooding across the road an alternate route to the south side of the road from Jamie Drive is available. Since the existing culverts at Robinson Road appear to be in good condition and alternate routes are available, no modifications are recommended at this time for the existing crossing.

At the time of this study, the Camp Wisdom Road Improvements Project being performed by Salcedo Group, Inc. included the replacement for both the east and west crossings of Camp Wisdom at Alspaugh branch. The west crossing is being replaced with 4-10'x8' CBC's that will pass the 100-year storm event with increases in velocities anticipated upstream and downstream of the proposed structure. The east crossing of Camp Wisdom Road will be replaced with the same size culverts (2-7'x6' CBC's) that are extended an additional 15 linear feet south to account for the wider proposed roadway. The proposed extension will have no adverse impacts on the surrounding areas.

Source: Aerials from City of Grand Prairie, 2013
Streets from City of Grand Prairie, 2014

Legend

- Alspaugh Branch Centerline
- Mountain Creek Centerline
- Subbasins

RDWY LEVEL OF SERVICE

- 10-YR
- 2-YR
- <2-YR

N

0 1,500 3,000 Feet

CITY-WIDE DRAINAGE MASTER PLAN FOR ALSPAUGH BRANCH (Y#0948)

ROADWAY CROSSINGS

AECOM TECHNICAL SERVICES, INC.
16000 DALLAS PARKWAY, SUITE 350
DALLAS, TEXAS 75248
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TBPE REG. NO. F-3580

Date: 04/14 | Project No.: 60185331 | Figure VI-1

VII. Alternatives for Streams and Open Channels

AECOM Technical Services, Inc.

City-Wide Drainage Master Plan for Alspaugh Branch (Y#0948)

VII. Alternatives for Streams and Open Channels

A. Areas of Concern

AECOM, in conjunction with City staff, evaluated the flooding to prepare a list of areas of potential concern. ***Table VII.1*** presents the flooding sites along the creek.

Table VII-1 – Potential Locations of Concern

Station	Description
N/A*	Lakewood retention Pond has a potential of flooding surrounding structures for the 100-year event
95+06	Robinson Road overtops during the 25-year storm event.

* Project falls outside of channel limits

Table VII-2 below shows a list of properties affected by the 100-year floodplain for which Elevation Certificates are to be prepared and attached in ***Appendix F***. Some of the more critical properties (closest to the source of flooding) have been surveyed in November 2013 and Finished Floor Elevations (FFE) for the structures were obtained (***Table VII-2***). The properties in consideration are presented in **Figure VII-1** at the end of this section.

Table VII-2 - Potential Locations of Concern

Number	Parcel Address	FFE* (ft)
1	1108 Seider Lane	N/A
2	1104 Seider Lane	N/A
3	1028 Seider Lane	N/A
4	1024 Seider Lane	N/A
5	1020 Seider Lane	N/A
6	1107 Seider Lane	N/A
7	1103 Seider Lane	N/A
8	1019 Seider Lane	N/A
9	5324 Othen Drive	531.377
10	5320 Othen Drive	530.997
11	5316 Othen Drive	537.645
12	5312 Othen Drive	531.817
13	1104 Jon Paul Drive	531.732
14	5433 Avery Lane	531.467
15	5431 Avery Lane	531.507

* FFE provided by Halff Associates, Inc. (November 2013)

B. Improvement Projects

The first alternative analyzed for flood mitigation for Alspaugh Branch was to modify the existing Lakewood residential retention Pond. The existing weir, separating the residential pond from

Alspaugh Branch, is approximately 12 feet wide at its base with a 40-foot long concrete pedestrian bridge across the top of the weir. Two potential improvement projects for this area were evaluated:

- Excavating the area to the northwest of the existing pond and creating a bypass swale that will release more flows downstream during the higher events, thereby reducing the peak WSELs in the pond. The swale would require regrading approximately 0.7 acres of the park and replacing approximately 200 feet of sidewalk. This alternative reduced the 100-year peak discharge by 80 cubic feet per second (cfs) or 4% of the existing conditions 100-year peak discharge. The preliminary cost estimate for this improvement project was found to be approximately $150,000.
- Upsizing the weir to 60 feet which will require removal and replacement of the existing pedestrian bridge with a 100-foot span. This will also require replacing approximately 200 feet of sidewalk. No preliminary costs were developed for this project as the City staff felt that there was too much impact to the existing pond and surrounding trails and entertainment/open space area which is currently owned by the Lakewood HOA. Instead the City decided to pursue this option only if Finished Floor Elevation survey of the existing structures around the pond showed a potential of structural flooding for the 100-year event.

As per the FFE survey for the most critically located properties around the Lakewood retention Pond, there is a minimum of 0.75 feet of freeboard to all structures for the 100-year ultimate conditions storm. This was considered sufficient justification to suspend the concept of structural modifications to the Lakewood retention Pond to reduce WSELs.

The second alternative analyzed for public safety reasons was to modify the existing culvert crossing at Robinson Road. The existing crossing consists of 2-6'x6' reinforced box culverts (RCBs) that are overtopped by the 25-year storm event. Three potential improvement projects were analyzed and compared for this area:

- Increase the height of the boxes by two feet, making them 6'x8' slender structures. This would require cast-in-place structures with special design by a Structural Engineer. Hydraulic analysis of this type of opening revealed no increase in the level of service as the 25-year will continue to overtop the proposed structure.
- Add a third 6'x6' CBC to the crossing. This would require channel widening and regrading upstream and downstream of the crossing to accommodate for the additional barrel. This option resulted in the lower WSELs upstream of the crossing; however, the 25-year would continue to overtop the proposed structure.
- For the purposes of evaluation only, AECOM upsized the Robinson Road crossing to 4-10'x8' CBCs to provide a 50-year level of protection (same as the Robinson Road-Cedar Creek crossing). Upgrading Robinson Road at Alspaugh Branch to a 50- or 100-year level of protection is not recommended due to the configuration of the creek in this area and the level of service of the roadway. This crossing is merely a residential access street at this location with easily accessible alternate routes.

After discussions with the City, it was determined that none of the solutions presented above are feasible for further consideration as a potential CIP project since there was minimal reduction in flooding.

However, in the interest of public safety, it is recommended that a warning sign and a flood gage are installed at Robinson Road to alert drivers of the depth of flooding.

C. Elevation Certificates

The City should consider preparing Elevation Certificates for homes around the Lakewood retention Pond that may be required to purchase additional flood insurance by their mortgage lender or bank once the new floodplain maps are published. As shown in ***Appendix A - Figure 6a***, the existing 100-year floodplain extends in to the neighborhood streets and there is a potential that the adjoining residences may require an Elevation Certificate to prove they are out of the new floodplain.

Based on the hydrologic and hydraulic analysis performed by AECOM, all residences around the Lakewood retention Pond are reasonably safe from flooding with sufficient freeboard; however, based on the existing 100-year floodplain mapping a portion of these properties (yards) may experience some level of flooding, thereby triggering purchase of mandatory flood insurance at full risk rates. The Elevation Certificates will allow the homeowner to provide the lender with proof that their homes are above the effective BFEs and therefore be exempt from the flood insurance mandate. For peace of mind, the homeowner can voluntarily choose to purchase flood insurance which will be available at a significantly discounted and prorated amount once the Elevation Certificate is provided to the insurance company.

The final Elevation Certificates for the properties should be appended in ***Appendix F***.

Source: Aerials from City of Grand Prairie, 2013
Streets and Drainage from City of Grand Prairie, 2014

Legend

- Alspaugh Branch Centerline
- Drainage Network
- 16122 Cross Sections (white)
- Parcels requiring Elevation Certificates
- Existing 100-Year Floodplain

Number	Parcel Address	Number	Parcel Address
1	1108 Seider Lane	9	5324 Othen Drive
2	1104 Seider Lane	10	5320 Othen Drive
3	1028 Seider Lane	11	5316 Othen Drive
4	1024 Seider Lane	12	5312 Othen Drive
5	1020 Seider Lane	13	1104 Jon Paul Drive
6	1107 Seider Lane	14	5433 Avery Lane
7	1103 Seider Lane	15	5431 Avery Lane
8	1019 Seider Lane		

N

0 150 300 Feet

CITY-WIDE DRAINAGE MASTER PLAN
FOR
ALSPAUGH BRANCH (Y#0948)

OVERALL PROJECT MAP

AECOM TECHNICAL SERVICES, INC.
16000 DALLAS PARKWAY, SUITE 350
DALLAS, TEXAS 75248
WWW.AECOM.COM
TBPE REG. NO. F-3580

Date: 04/14 | Project No.: 60285901 | FIGURE VII-1

VIII. Storm Water Infrastructure Analysis

AECOM Technical Services, Inc.

City-Wide Drainage Master Plan for Alspaugh Branch (Y#0948)

VIII. Storm Water Infrastructure Analysis

IX. Channel Stability Assessment/Erosion Hazard Analysis

AECOM Technical Services, Inc.

City-Wide Drainage Master Plan for Alspaugh Branch (Y#0948)

IX. Channel Stability Assessment/Erosion Hazard Analysis

During the two site visits occurring on November 11, 2012 and March 6, 2013, no major channel erosion issues were noticed in Alspaugh Branch. Some areas near the Camp Wisdom crossings showed signs of erosive velocities. The proposed Camp Wisdom west crossing could potentially see an increase the erosive velocities in its vicinity due to the higher proposed roadway embankment and contraction/expansion of flow through the proposed crossing. The Topographic Work Map (***Appendix A - Figures 6a & 6b***) shows the Erosion Hazard setback for Alspaugh Branch. The Erosion Hazard setback was delineated as a 10-foot offset from the 100-year existing floodplain. This was done to preserve the open space available in watershed while preventing future development in the existing floodplain. In the areas, where the setback infringed upon existing infrastructure (fences, curbs, roads, building pads, etc.), the setback was modified to exclude such overlaps.

X. Dams/Levees/Detention/Drainage Reviews

X. Dams/Levees/Detention/Drainage Reviews

XI. Maintenance – (Alspaugh Branch)

AECOM Technical Services, Inc.

City-Wide Drainage Master Plan for Alspaugh Branch (Y#0948)

XI. Maintenance – (Alspaugh Branch)

XII. Preliminary Quantities/Estimates of Probable Cost

AECOM Technical Services, Inc.

City-Wide Drainage Master Plan for Alspaugh Branch (Y#0948)

XII. Preliminary Quantities/Estimates of Probable Cost

Preliminary quantities and estimates of probable cost were calculated the public safety project recommended in ***Section VII*** of this report.

This cost analysis is presented for budgeting purposes only. It uses current TxDOT low bid average costs where available, and current construction bid information from projects in the surrounding area for all other unit costs.

Table XII-1 – Breakdown of Opinion of Probable Costs

Total Cost of All Improvement Projects	**$3,000**
Robinson Road signage	$3,000

XIII. Evaluation & Prioritization/Phasing & Implementation

AECOM Technical Services, Inc.

City-Wide Drainage Master Plan for Alspaugh Branch (Y#0948)

XIII. Evaluation & Prioritization/Phasing & Implementation

A. Evaluation & Prioritization

AECOM developed one (1) public safety project that is shown on ***Figure VII-1*** of this report. AECOM evaluated the project within the Alspaugh Creek watershed. A process of assigning ranking factors was utilized to rate short-term and long-term priority projects based on criteria from Section II.G of the City of Grand Prairie City-Wide Drainage Master Plan Road Map. Refer to ***Table XIII.1*** for the final proposed CIP rankings. The following is a brief summary of the criteria and methodology utilized to rank short-term and long-term priority projects to be incorporated into the overall City-Wide implementation plan.

1. Ranking Criteria

i. *Number of properties/structures benefited* - The number of structures benefited by the reduction in flood damage was determined for each proposed CIP alternative. There were no structures benefitted for any of the proposed CIP projects by the reduction in flood or erosion damage.

ii. *Estimates of probable cost* - A preliminary cost-estimate was determined for each proposed CIP alternative and then categorized as follows:

- **Small Projects -** Less than $500,000
- **Medium Projects** - $500,000 to $1,500,000
- **Large Projects -** $1,500,000 to $5,000,000
- **Extra-Large Projects -** $5,000,000 to $10,000,000
- **Super Size Projects -** Greater than $10,000,000

iii. *Roadway Type Benefited* - Each proposed CIP alternative roadway was categorized based on existing roadway type. Categories include **HWY, P7U, P6D, P4D, P3U, M5U, M4U, M3U, C2U,** and **No Roadway** (if no roadway benefits are included with project).

iv. *Roadway Flood Event Protection* - The level of flood protection, if no improvements were made, was determined for each proposed CIP alternative roadway crossing. AECOM described existing roadway crossing protection based on the following storm events: 2-year, 5-year, 10-year, 25-year, 50-year, or 100-year (existing).

v. *Roadway Citizens Protected/Impacted* - Per Ranking Factor #3 below, an approximate percentage of total roadway citizens impacted was determined for each proposed CIP alternative if no improvements were made.

vi. *Ultimate 100-Year Discharge*-. The ultimate 100-year discharge was determined for each proposed CIP alternative location.

2. Ranking Methodology

i. *Ranking Factor #1-* The initial ranking factor was based on the estimate of probable cost versus the number of properties/structures benefited:

Determine Initial Ranking Factor		No. of Properties/Structures Benefited		
		High > 10	Medium 5 to 10	Small < 5
Estimate of Probable Cost ($)	Small < $500k	1	2	3
	Medium $500k - $1.5M	2	3	4
	Large > $1.5M	3	4	5
	X-Large > $5M	6	7	8
	Super-Size > $10M	9	10	11

ii. *Ranking Factor #2* - A second ranking factor was determined based on the number of citizens impacted, by potential for roadway shutdowns if no improvements were made on existing roadways, and by a cost to benefit ratio of proposed improvements per roadway citizens impacted.

Step 1 - Determine Existing Roadway Type

Roadway Type
HWY
P7U
P6D
P4D
P3U
M5U
M4U
M3U
C2U

Step 2 - Determine Existing Conditions Roadway Flood Event Protection and Percentage of Roadway Citizens Protected

Roadway Flood Event Protection	Percentage of Citizens Protected [1]
1-Year	0%
2-Year	15%
5-Year	35%
10-Year	50%
25-Year	70%
50-Year	85%

Roadway Flood Event Protection	Percentage of Citizens Protected [1]
100-Year	100%

[1] Based on approximation, using logarithmic chart, with 1-Year Event coverage protecting 0% and with 100-Year Event protecting 100%

Step 3 - Determine Percentage of Roadway Citizens Impacted 100% minus percentage of citizens protected

100% minus percentage of citizens protected in Sub-Step 2

Step 4 - Determine Number of Roadway Citizens Impacted

Roadway Type Benefited	Percentage of Citizens Protected [1]
HWY	20800
P7U	12740
P6D	11700
P4D	7800
P3U	5460
M5U	8450
M4U	6760
M3U	5070
C2U	2730

[1] Based on percentage of citizens impacted multiplied by [No. Lanes * 4 hours impacted * hourly volume per lane * Level of Service C Traffic Volume (see table below)]

Grand Prairie Classification	NCTCOG Classification	Lanes	Hourly Service Vol./lane	NCTCOG LOS*			Current UDC "LOS C" Traffic Volume
				Roadway Capacity LOS E	LOS D	LOS C	
P7U	Principal Arterial-Undiv.	7	700	49,000	39,200	31,850	42,000
P6D	Principal Arterial-Divided	6	750	45,000	36,000	29,250	42,000
P4D	Principal Arterial-Divided	4	750	30,000	24,000	19,500	28,000
P3U	Principal Arterial-Undiv.	3	700	21,000	16,800	13,650	18,000
M5U	Minor Arterial	5	650	32,500	26,000	21,125	28,000
M4U	Minor Arterial	4	650	26,000	20,800	16,900	22,000
M3U	Minor Arterial	3	650	19,500	15,600	12,675	18,000
C2U	Collector	2	525	10,500	8,400	6,825	10,000
L2U	Local Street	2	525	10,500	8,400	6,825	8,000
LU	Local Street	1	525	5,250	4,200	3,413	8,000
R2U	Rural Street	2	525	10,500	8,400	6,825	8,000

* = from the Dallas-Fort Worth Regional Travel Model Manual, Exhibits 23 and 24
NCTCOG capacity: LOS E = (# lanes) * 10 * (NCTCOG Hourly Service Volume per Lane)
NCTCOG capacity: LOS D = (LOS E) * .8
NCTCOG capacity: LOS C = (LOS E) * .65

Step 5 - Divide Cost to Benefit of Roadway Number of Citizens Impacted

Divide the estimate of probable cost by the results from Step 4 to determine the cost to benefit ratio (in dollars)

Step 6 - Develop Second Ranking Factor with highest rank being the lowest cost to benefit ratio

iii. *Ranking Factor #3-.* A third ranking factor was determined based on the total tax value of all the properties with structures that are benefited by the project from Ranking Factor #1. The Third Ranking Factor was based on the table below.

Total Tax Value of Properties with Structures Benefited	Third Ranking Factor
$2,000,000 +	1
≥ $1,900,000	2
≥ $1,800,000	3
≥ $1,700,000	4
≥ $1,600,000	5
≥ $1,500,000	6
≥ $1,400,000	7
≥ $1,300,000	8
≥ $1,200,000	9
≥ $1,100,000	10
≥ $1,000,000	11
≥ $900,000	12
≥ $800,000	13
≥ $700,000	14
≥ $600,000	15
≥ $500,000	16
≥ $400,000	17
≥ $300,000	18
≥ $200,000	19
$0 to $199,999	20

iv. *Initial Ranking* - A total ranking factor was determined using the summation of Ranking Factors #1, #2, and #3. The initial ranking of proposed CIP alternatives was determined with the top ranked (#1) project having the lowest total ranking factor.

v. *Final Ranking* - If two or more projects had the same initial ranking, the projects were sorted further using the ultimate 100-year discharge at each project location. The higher ranked of these projects was the one with the greatest ultimate 100-year discharge at the project location.

B. Phasing & Implementation

Final Short-term Priorities Implementation

Short-term Priority CIPs could generally be described as those projects with an initial ranking factor of 1, 2, or 3 from the matrix under Ranking Factor #1 above. The Short-term Priority projects would become the City's key Capital Improvement Projects for immediate implementation, contingent upon City Council approval and allocated funding. Prior to beginning the construction process on these projects, the following key issues may need to be examined:

- Public or private participation in funding and implementation
- Drainage right-of-way or easement needs
- Permitting – FEMA, NCTCOG, U.S. Army Corps of Engineers,, TCEQ, or EPA
- Public or neighborhood meetings to describe the project and receive citizen feedback
- Adherence of the project to the City's ordinances and standards for construction

Final Long-term Plan Implementation

All other CIPs not classified as Short-term priorities will be considered **Long-term CIPs**. These need to be planned properly with funding allocated for future construction, contingent of City Council approval. Projects that could be constructed by phasing (i.e. will phasing provide immediate benefits or does the whole project need to be constructed for benefits to occur) would need to be re-evaluated by eat Phase and re-ranked accordingly with the other CIP alternatives.

For the Long-term projects, the following key issues may need to be examined:

- All the Short-term issues listed above
- Longer range funding plans for larger projects, including phasing (look into State and Federal grants and construction loans)
- More global view, watershed-wide or regional type projects (look into cooperative efforts with U.S. Army Corps of Engineers, NCTCOG, or adjacent communities)
- Examine how increased development of the City's flood warning system could provide further benefits to these areas until funding is allocated for project implementation.
- Non-structural measures including:
  - **Buy-out Program –** City would need to decide on perpetual maintenance of property or re-selling property after measures are taken to remove lot from flood hazard. Recommend pursuit of City funding, if available, or associated grants (see CWDMP Roadmap Section II.D – Funding Opportunities), if applicable.
  - Enforce new and/or improved development standards to restrict future development in flood hazard areas

Table XIII-1 - Short-Term & Long-Term Implementation Plan

Alspaugh Branch Watershed

	Capital Improvement Project	Project Size & Short-Term/Long-Term	Step 1 - Initial Ranking Factor - Estimate of Probable Cost vs. # Structures Benefited [1]			Step 2 - Second Ranking Factor - Cost to Benefit of Roadway Number of Citizens Impacted [2]							Step 3 - Tax Value of Benefited Property Structures [7]		Sum of 1st, 2nd, and 3rd Factors - Step 4	Initial Rank - Step 4	100-Year Ultimate Discharge at CIP Location - Step 5		Final Rank - Step 6
			# Structures	Cost	1st Factor [1]	Type	Roadway Flood Event Protection	Roadway % Citizens Protected [3]	Roadway % Citizens Impacted [4]	Roadway # Citizens Impacted [5]	Cost to Benefit Roadway # Citizens Impacted [6]	2nd Factor	Tax Value of Property Structures Benefited	3rd Factor	Total	Rank [8]	Ultimate Q_{100}	Sorting [9]	Rank [10]
1	**Project 1** - Robinson Road Crossing - Install Caution Signs	Small/Short-Term	0	$3,000	**3**	C2U	10-year	50%	50%	2730	1.099	**1**	$0	**20**	**24**	**1**	2,100	**1**	**1**

1 Refer to City-Wide Drainage Master Plan Road Map, Section II.G - Implementation Plan - Step 1
2 Refer to City-Wide Drainage Master Plan Road Map, Section II.G - Implementation Plan - Step 2
3 Based on approximation, using logarithmic chart, with 1-Year Event coverage protecting 0% of traffic volume and 100-Year Event coverage protecting 100% of traffic volume
4 Percent Impacted = 100% minus % of Roadway Citizens Protected (approximate)
5 Number Impacted = % Impacted multiplied by [No. Lanes * 4 Hours Impacted * Hourly Volume Per Lane * Level of Service "C" Traffic Volume]
6 Cost of CIP divided by Roadway # Citizens Impacted
7 Refer to City-Wide Drainage Master Plan Road Map, Section II.G - Implementation Plan - Step 3
8 Refer to City-Wide Drainage Master Plan Road Map, Section II.G - Implementation Plan - Step 4
9 Refer to City-Wide Drainage Master Plan Road Map, Section II.G - Implementation Plan - Step 5
10 Refer to City-Wide Drainage Master Plan Road Map, Section II.G - Implementation Plan - Step 6

Additional Notes:
a. Phased projects shall be ranked in order of Phasing (i.e. Phase 1 shall be ranked higher than Phase 2, etc.)

XIV. Short Term Priorities & Long Term Plan

XIV. Short Term Priorities & Long Term Plan

A. Short-Term Priorities Implementation

In the interest of public safety, it is recommended that the City install signage at the Robinson Road crossing to deter drivers from crossing the flooded roadway. It is also recommended to install a flood gage to provide a visual of the depth of flooding at the crossing. The cost for this implementation is minimal and will increase public awareness of a potentially hazardous condition at this crossing.

The City should consider preparing Elevation Certificates for homes around the Lakewood retention Pond that may be required to purchase additional flood insurance by their mortgage lender or bank once the new floodplain maps are published. Based on the hydrologic and hydraulic analysis performed by AECOM, all residences around the Lakewood retention Pond are reasonably safe from flooding with sufficient freeboard; however, based on the existing 100-year floodplain mapping a portion of these properties (yards) may experience some level of flooding, thereby triggering purchase of mandatory flood insurance at full risk rates. The Elevation Certificates will allow the homeowner to provide the lender with proof that their homes are above the effective BFEs and therefore be exempt from the flood insurance mandate. For peace of mind, the homeowner can voluntarily choose to purchase flood insurance which will be available at a significantly discounted and prorated amount once the Elevation Certificate is provided to the insurance company.

B. Long-Term Plan Implementation

Long-term plan implementation will include maintenance associated with storm drain outfall structures that discharge in to the creek and have a potential of affecting the storm drain pipe and receiving channel. These structures should be periodically inspected and maintained. No cost estimate was prepared for these items due to the varied nature of these outfall locations.

AECOM recommends periodic maintenance of the Robinson Road and the two Camp Wisdom Road crossings. These culverts should be regularly cleared of debris and siltation to ensure all the culverts are capable of passing their design flows.

XV. Master Study Plan Wrap-up & Recommendations for Future Action

XV. Master Study Plan Wrap-up & Recommendations for Future Action

The City-Wide Drainage Master Plan for the Alspaugh Branch watershed provides comprehensive, updated technical data for the management of Alspaugh Branch. This report addresses existing flooding within the watershed and provides due diligence and public safety measures to address future issues that may arise. The information presented in this report will provide the City of Grand Prairie with the necessary updated drainage information to coordinate future development and help minimize existing and potential future problems within the Alspaugh Branch watershed.

A. Streams and Open Channels

The majority of Alspaugh Branch runs through unoccupied land and therefore has fewer areas of concern than a typical watershed of this size. ***Section VII*** of this report presents the analyzed alternatives which were evaluated to help alleviate the two areas of concern along Alspaugh Branch. AECOM analyzed all the stream crossings and no improvements are recommended (***Section VI***).

B. Future Studies & Report

Future studies and technical data should be incorporated into this report as they become available. Maintenance of the City-Wide Drainage Master Plan document will be critical to keeping the document accurate. Future LOMRs and watershed studies should be included as attachments in this same document. Final hydrologic and hydraulic models should be added to ***Appendix C.1*** - ***C.3***..

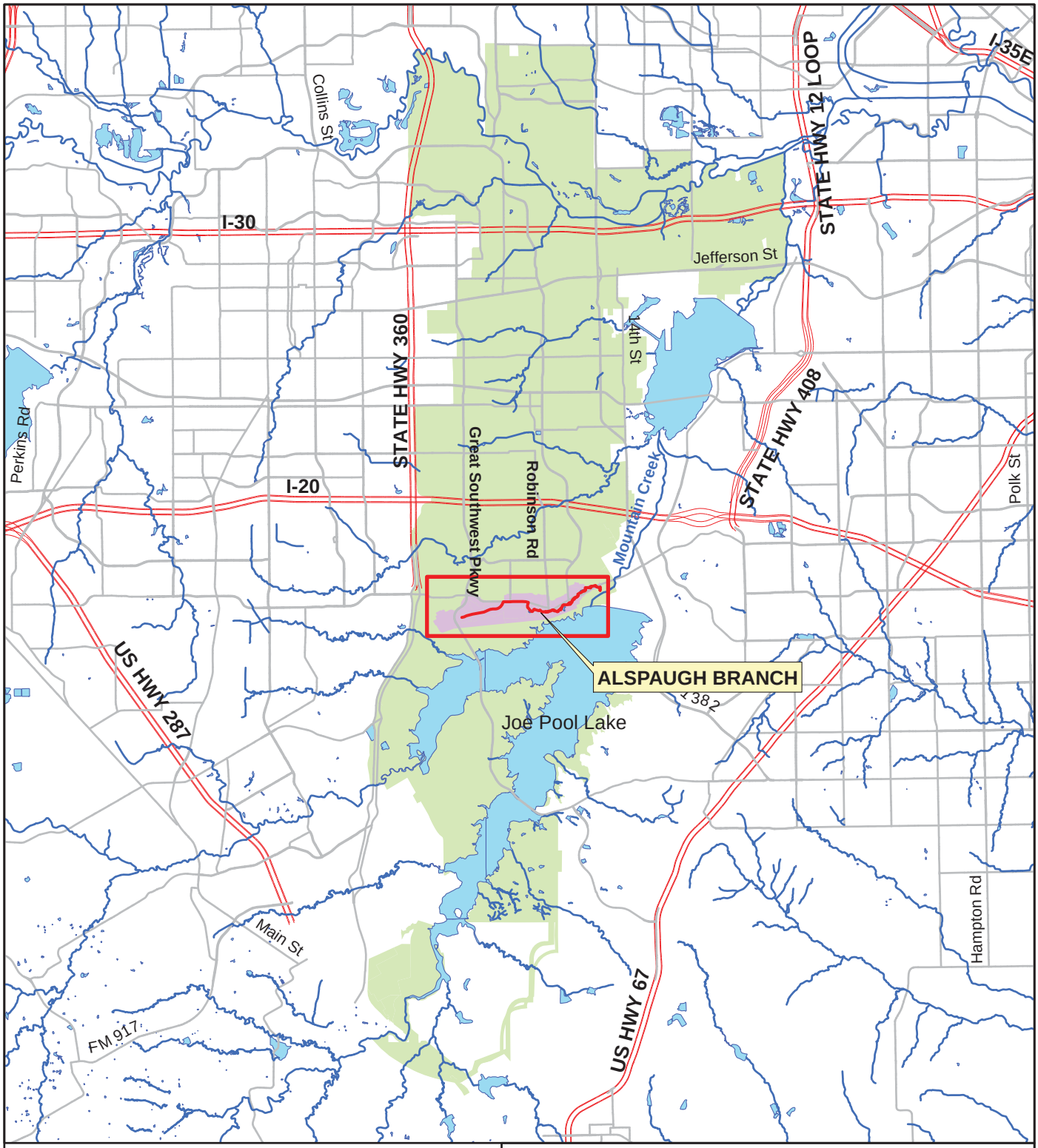
C. Future Development in the Watershed

The Alspaugh Branch watershed has a large undeveloped tract of land (approximately 70 acres), currently zoned agricultural, in the middle reaches that has a potential for producing significant additional runoff when it is developed. Though this Drainage Master Plan accounts for the full development of the watershed, including tracts like this, it would be beneficial for the City to maintain existing discharges from a water quality standpoint. It should be noted that unmitigated development of these tracts has been considered in the hydrologic and hydraulic analysis of the report and though no negative impacts to life or property is expected due to the additional runoff, all new development should be independently evaluated for its potential impact downstream using the guidelines set forth in the most current City of Grand Prairie DDM at that time.

The findings of this report for fully developed (ultimate) conditions is based on a set of engineering assumptions and best available zoning information and therefore an independent evaluation of the impacts of proposed development anywhere in the watershed should be performed on a case-by-case basis.

Appendix A

Pertinent Figures for Alspaugh Branch (Y#0948)



Legend

- Alspaugh Branch
- Alspaugh Watershed
- City of Grand Prairie

N

0 3 6 Miles

CITY-WIDE DRAINAGE MASTER PLAN
FOR
ALSPAUGH BRANCH (Y#0948)

VICINITY MAP

AECOM TECHNICAL SERVICES, INC.
16000 DALLAS PARKWAY, SUITE 350
DALLAS, TEXAS 75248
WWW.AECOM.COM
TBPE REG. NO. F-3580

Date: 04/14	Project No.: 60285901	Figure 1

Source: Aerials from City of Grand Prairie, 2013
Streets and Drainage from City of Grand Prairie, 2014
Contours from City of Grand Prairie, 2009

Legend

- HEC-HMS Analysis Point
- Mountain Creek Centerline
- Alspaugh Branch Centerline
- Subbasins
- Drainage Network
- 5 Foot Countours

Subbasin	Drainage Area (ac.)	Existing Lag Time (min.)	Ultimate Lag Time (min.)	Composite Curve Number	Existing % Impervious	Ultimate % Impervious
PondPack						
A-1	129	14.33	14.33	80	40.23	48.96
A-2	15	6.42	6.42	80	50.13	50.13
A-3	13	5.33	5.33	80	56.88	56.88
A-4	33	11.76	9.26	80	46.72	66.77
A-5	20	7.05	7.05	80	50.17	50.17
A-6	27	9.32	8.19	80	55.47	61.13
A-7	26	3.64	3.64	80	48.37	48.37
A-8	64	9.77	9.77	80	65.11	65.11
A-9	59	16.26	15.59	80	45.05	67.64
A-10	90	15.23	15.23	80	43.96	51.64
A-11	37	11.17	11.17	80	67.71	68.39
A-12	67	26.76	26.76	80	27.75	31.84
A-13	11	7.29	7.29	80	71.32	71.32

Subbasin	Drainage Area (ac.)	Existing Lag Time (min.)	Ultimate Lag Time (min.)	Composite Curve Number	Existing % Impervious	Ultimate % Impervious
HEC-HMS						
A-14	28	9.91	9.91	80	61.51	61.51
A-15	22	9.04	9.04	80	71.21	71.21
A-16	17	10.10	10.10	80	59.70	59.72
A-17	17	7.36	7.36	80	49.57	50.00
A-18A	14	14.10	14.10	80	38.64	62.22
A-18B	26	21.78	16.10	80	24.68	48.76
A-19A	95	18.73	18.73	80	17.91	17.91
A-19B	65	17.60	17.60	80	3.43	4.08
A-20	104	22.98	18.46	80	9.15	22.15
A-21	27	7.54	7.54	80	53.34	64.40
A-22	20	6.21	6.21	80	23.49	23.96
A-23	28	12.76	12.76	80	43.85	45.53
A-24	11	8.90	8.90	76	19.36	19.36

N

0 1,500 3,000 Feet

CITY-WIDE DRAINAGE MASTER PLAN
FOR
ALSPAUGH BRANCH (Y#0948)

DRAINAGE AREA MAP

AECOM TECHNICAL SERVICES, INC.
16000 DALLAS PARKWAY, SUITE 350
DALLAS, TEXAS 75248
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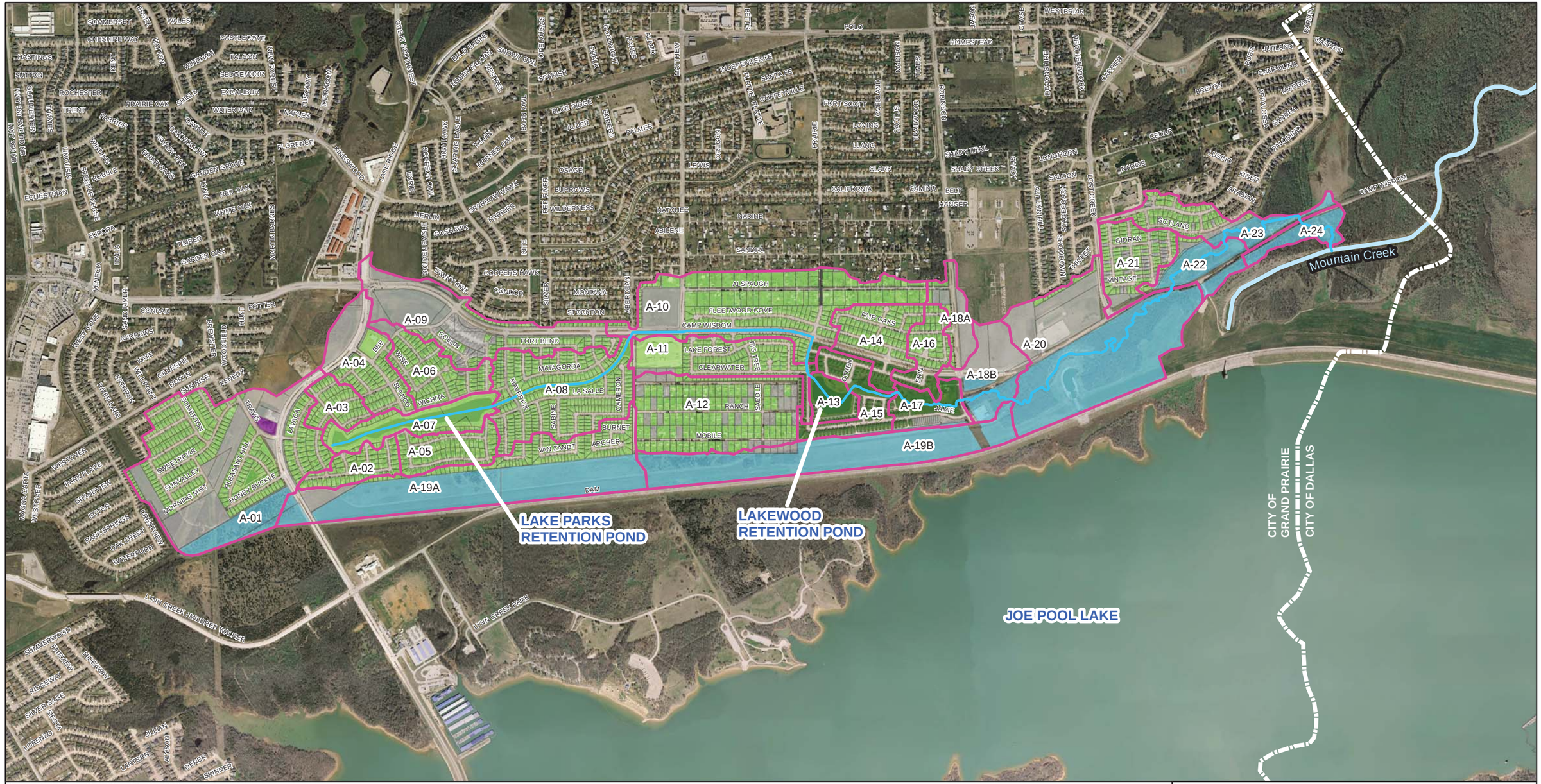
TBPE REG. NO. F-3580

Date: 04/14 | Project No.: 60285901 | Figure 2



Source: Aerials from City of Grand Prairie, 2013
Streets from City of Grand Prairie, 2014

Legend

- Alspaugh Branch Centerline
- Mountain Creek Centerline
- Subbasins
- COMMERCIAL
- HIGH DENSITY RESIDENTIAL
- LOW DENSITY RESIDENTIAL
- OPEN SPACE
- VACANT

N

0 1,500 3,000 Feet

CITY-WIDE DRAINAGE MASTER PLAN FOR ALSPAUGH BRANCH (Y#0948)

EXISTING LAND USE MAP

AECOM TECHNICAL SERVICES, INC.
16000 DALLAS PARKWAY, SUITE 350
DALLAS, TEXAS 75248
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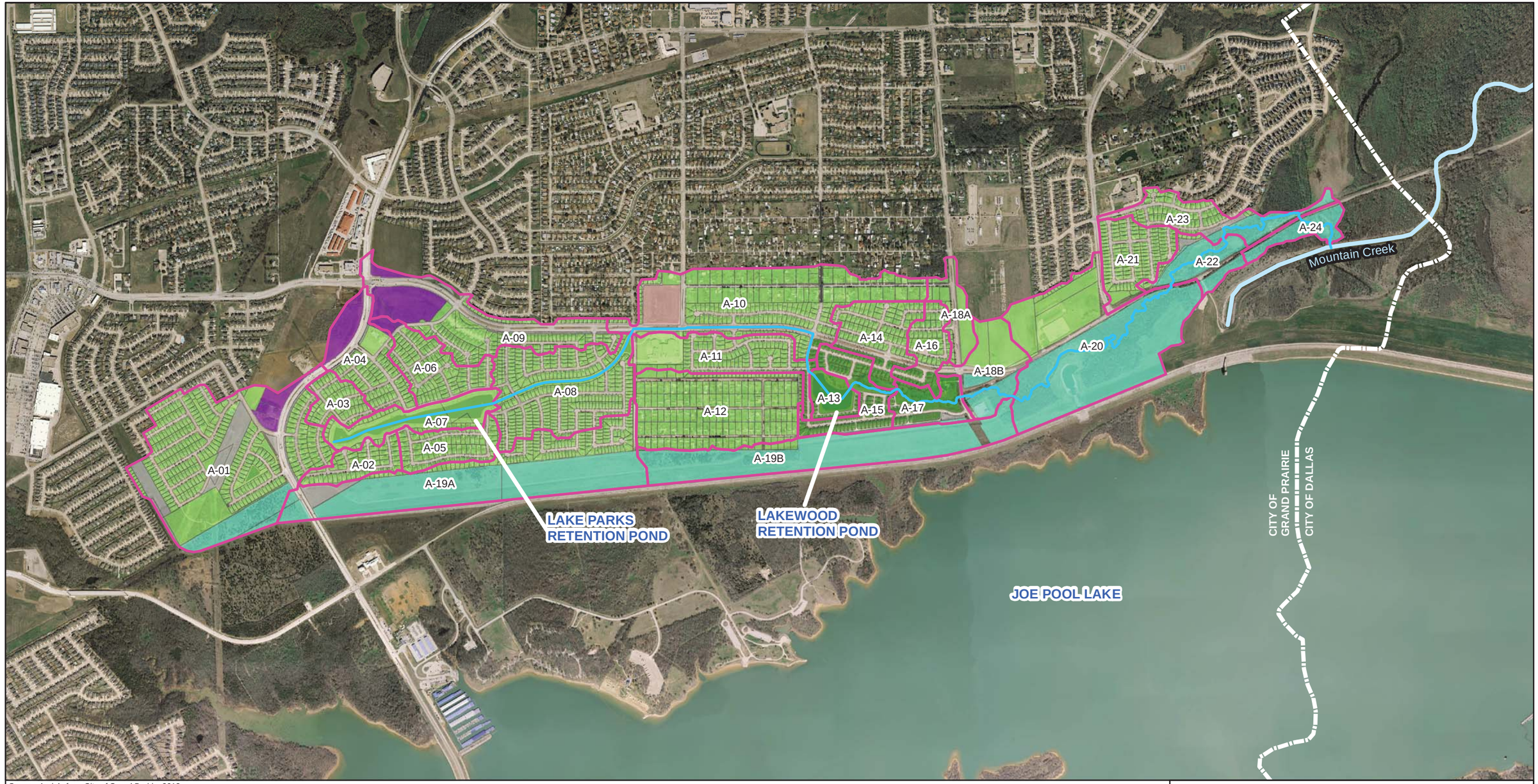
TBPE REG. NO. F-3580

Date: 04/14 | Project No.: 60285901 | Figure 3



Source: Aerials from City of Grand Prairie, 2013
Streets from City of Grand Prairie, 2014

Legend

- Alspaugh Branch Centerline
- Mountain Creek Centerline
- Subbasins
- COMMERCIAL
- HIGH DENSITY RESIDENTIAL
- LOW DENSITY RESIDENTIAL
- MIXED USE
- OPEN SPACE
- VACANT

N

0 1,500 3,000 Feet

CITY-WIDE DRAINAGE MASTER PLAN FOR ALSPAUGH BRANCH (Y#0948)

FUTURE LAND USE MAP

AECOM TECHNICAL SERVICES, INC.
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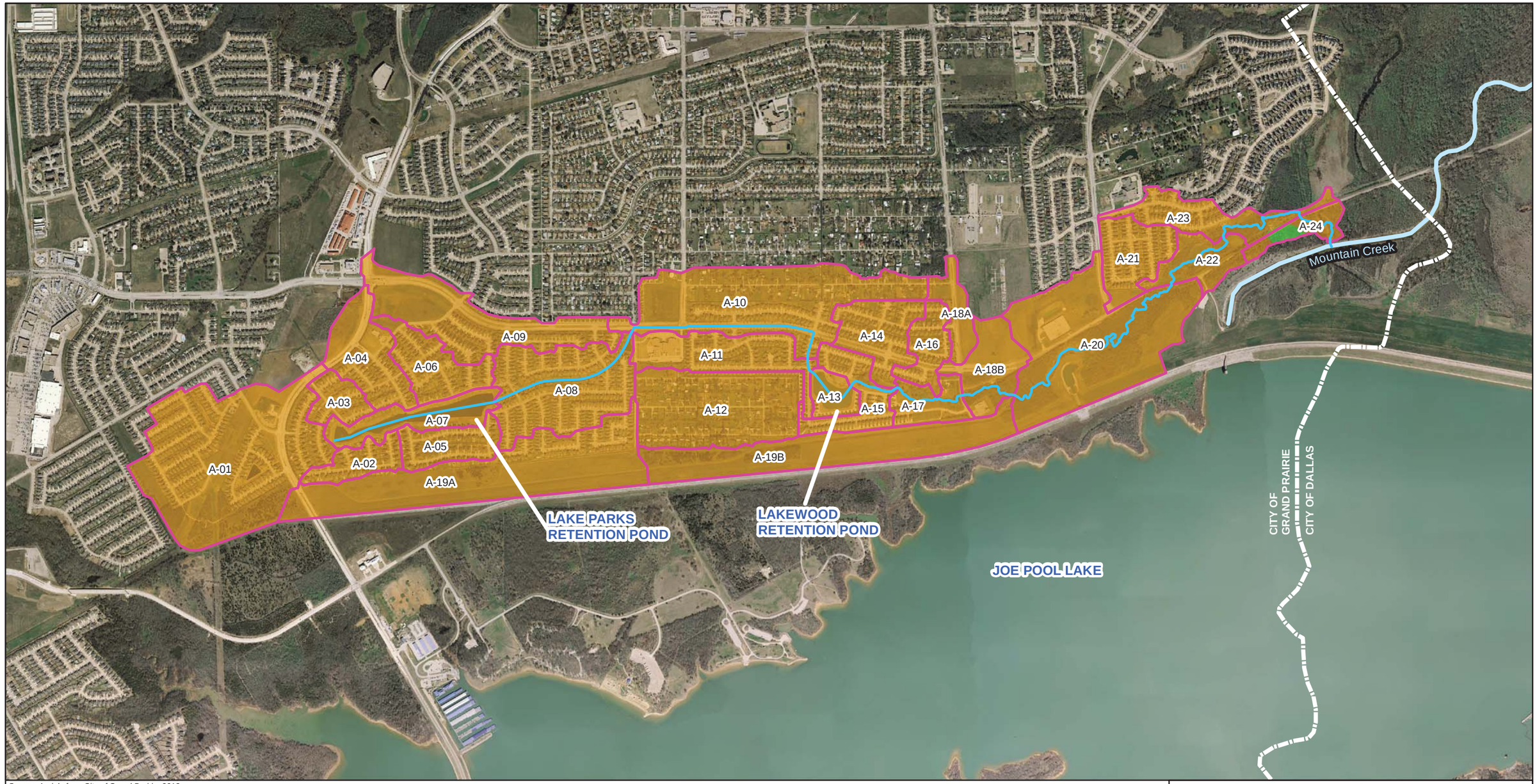
DALLAS, TEXAS 75248
WWW.AECOM.COM
TBPE REG. NO. F-3580

Date: 04/14 | Project No.: 60285901 | Figure 4



Source: Aerials from City of Grand Prairie, 2013
Streets from City of Grand Prairie, 2014

Legend

- Alspaugh Branch Centerline
- Mountain Creek Centerline
- Subbasins

Soils

- Hydrologic Soil Type B
- Hydrologic Soil Type D

N

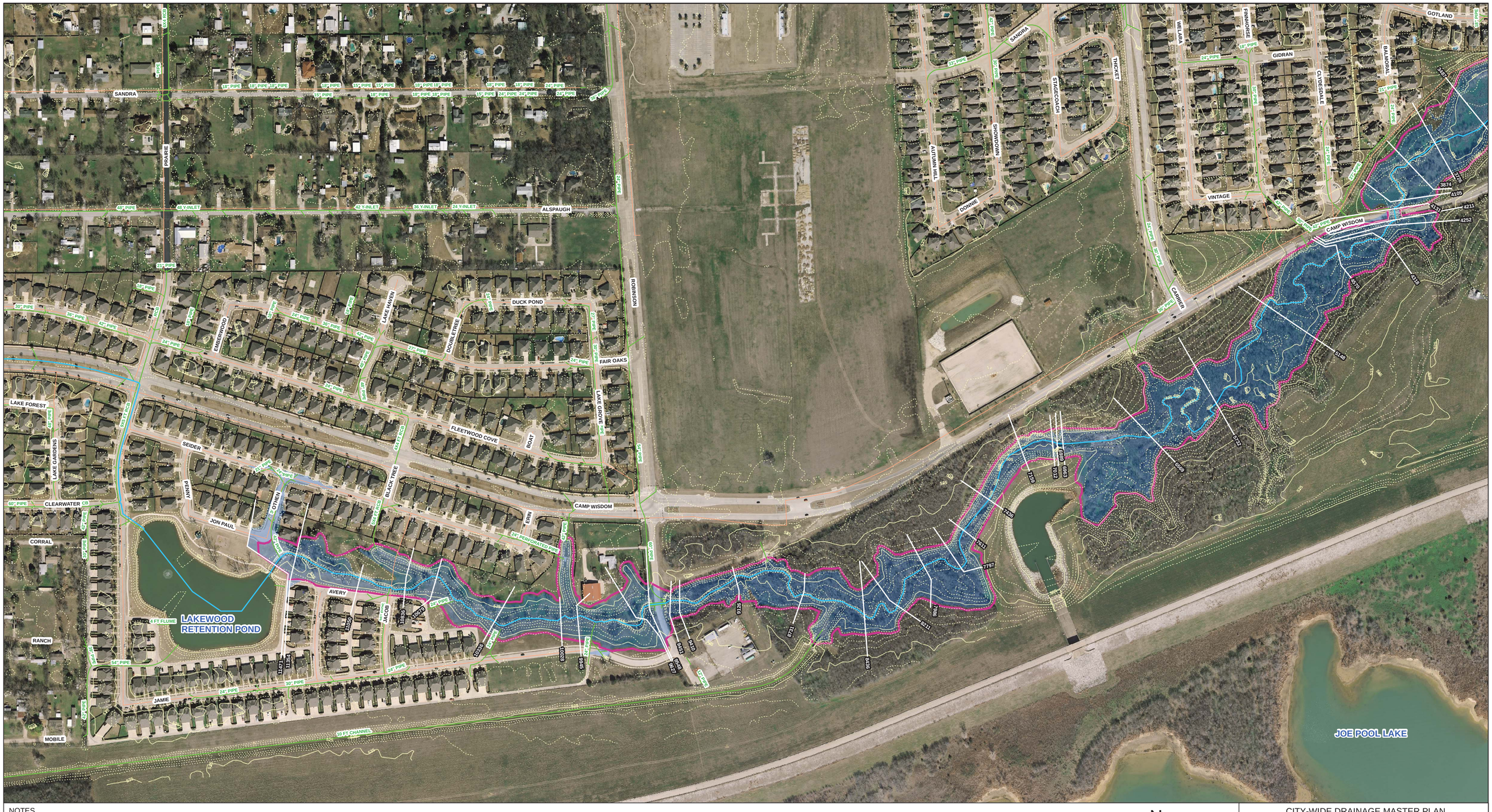
0 1,500 3,000 Feet

CITY-WIDE DRAINAGE MASTER PLAN
FOR
ALSPAUGH BRANCH (Y#0948)

SOILS MAP

AECOM TECHNICAL SERVICES, INC.
16000 DALLAS PARKWAY, SUITE 350
DALLAS, TEXAS 75248
WWW.AECOM.COM
TBPE REG. NO. F-3580

Date: 04/14 | Project No.: 60185331 | Figure 5



NOTES
1. 1-ft contours provided by City of Grand Prairie, 2009.
2. Aerials from City of Grand Prairie, 2013
3. Vertical datum based of North American Vertical Datum of 1988 (NAVD 88).
4. Ultimate 100-year floodplain is very close to the Existing 100-year floodplain at this scale.

Legend

- Cross Sections
- Alspaugh Branch Centerline
- Erosion Hazard Setback
- Existing 100-Year Floodplain
- Sanitary Sewer Lines
- Drainage Network
- 1-Foot Contours
  - Major
  - Minor

N

0 200 400 Feet

CITY-WIDE DRAINAGE MASTER PLAN FOR ALSPAUGH BRANCH (Y#0948)

TOPOGRAPHIC WORK MAP (LAKEWOOD RETENTION POND TO CAMP WISDOM ROAD)

AECOM TECHNICAL SERVICES, INC.
16000 DALLAS PARKWAY, SUITE 350
DALLAS, TEXAS 75248
WWW.AECOM.COM
TBPE REG. NO. F-3580

DATE: 04/14 | PROJECT NO.: 60285901 | Figure 6a

NOTES
1. 1-ft contours provided by City of Grand Prairie, 2009.
2. Aerials from City of Grand Prairie, 2013
3. Vertical datum based of North American Vertical Datum of 1988 (NAVD 88).
4. Ultimate 100-year floodplain line is very similar to the Existing 100-year floodplain at this scale.

Legend

- Cross Sections
- Alspaugh Branch Centerline
- Mountain Creek Centerline
- Erosion Hazard Setback
- Existing 100-Year Floodplain
- Sanitary Sewer Lines
- Drainage Network

1-Foot Contours
- Major
- Minor

N

0 200 400 Feet

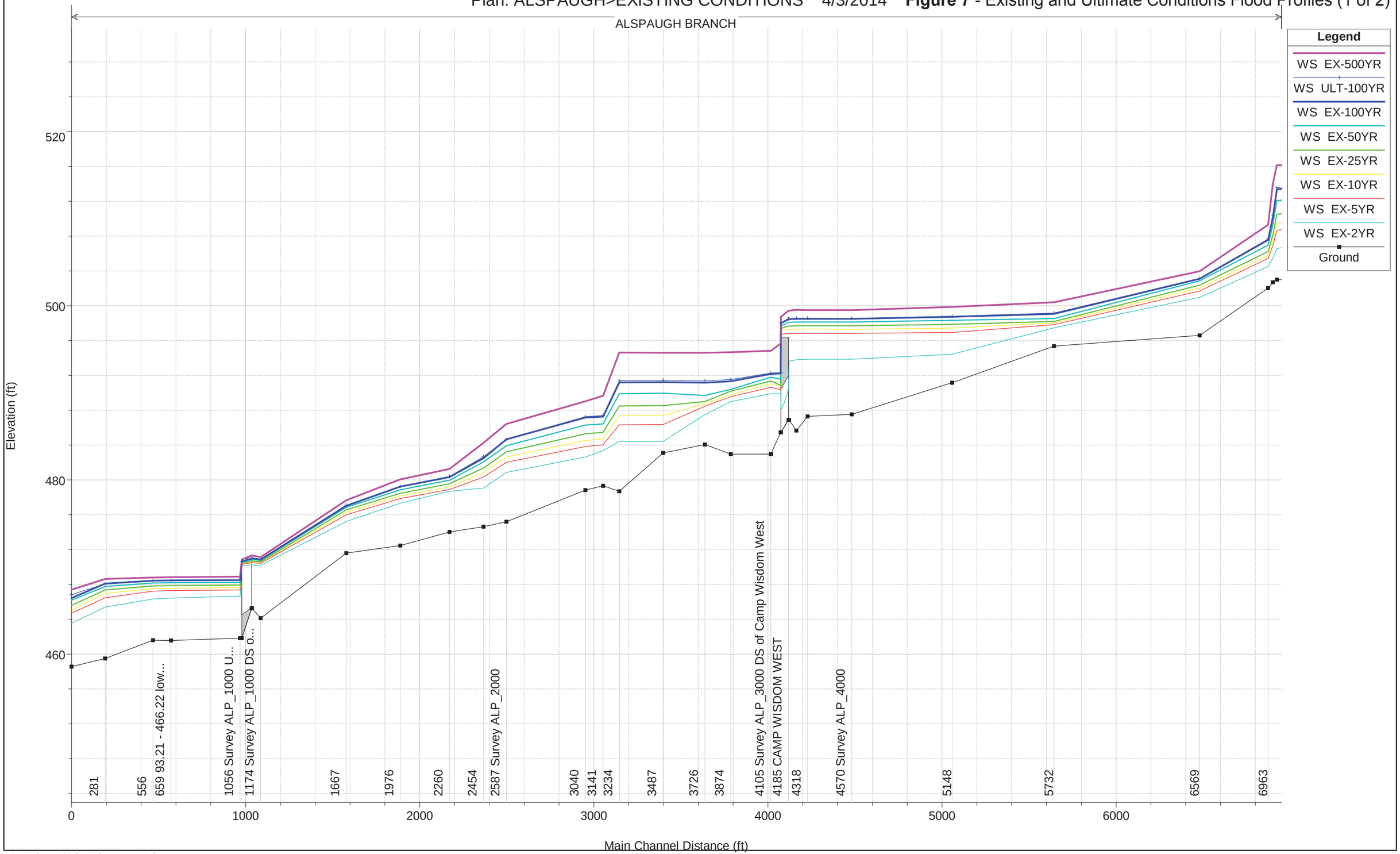
CITY-WIDE DRAINAGE MASTER PLAN
FOR
ALSPAUGH BRANCH (Y#0948)

TOPOGRAPHIC WORK MAP
(CAMP WISDOM ROAD TO CONFLUENCE)

AECOM TECHNICAL SERVICES, INC.
16000 DALLAS PARKWAY, SUITE 350
DALLAS, TEXAS 75248
WWW.AECOM.COM
TBPE REG. NO. F-3580

DATE: 04/14 | PROJECT NO.: 60285901 | Figure 6b

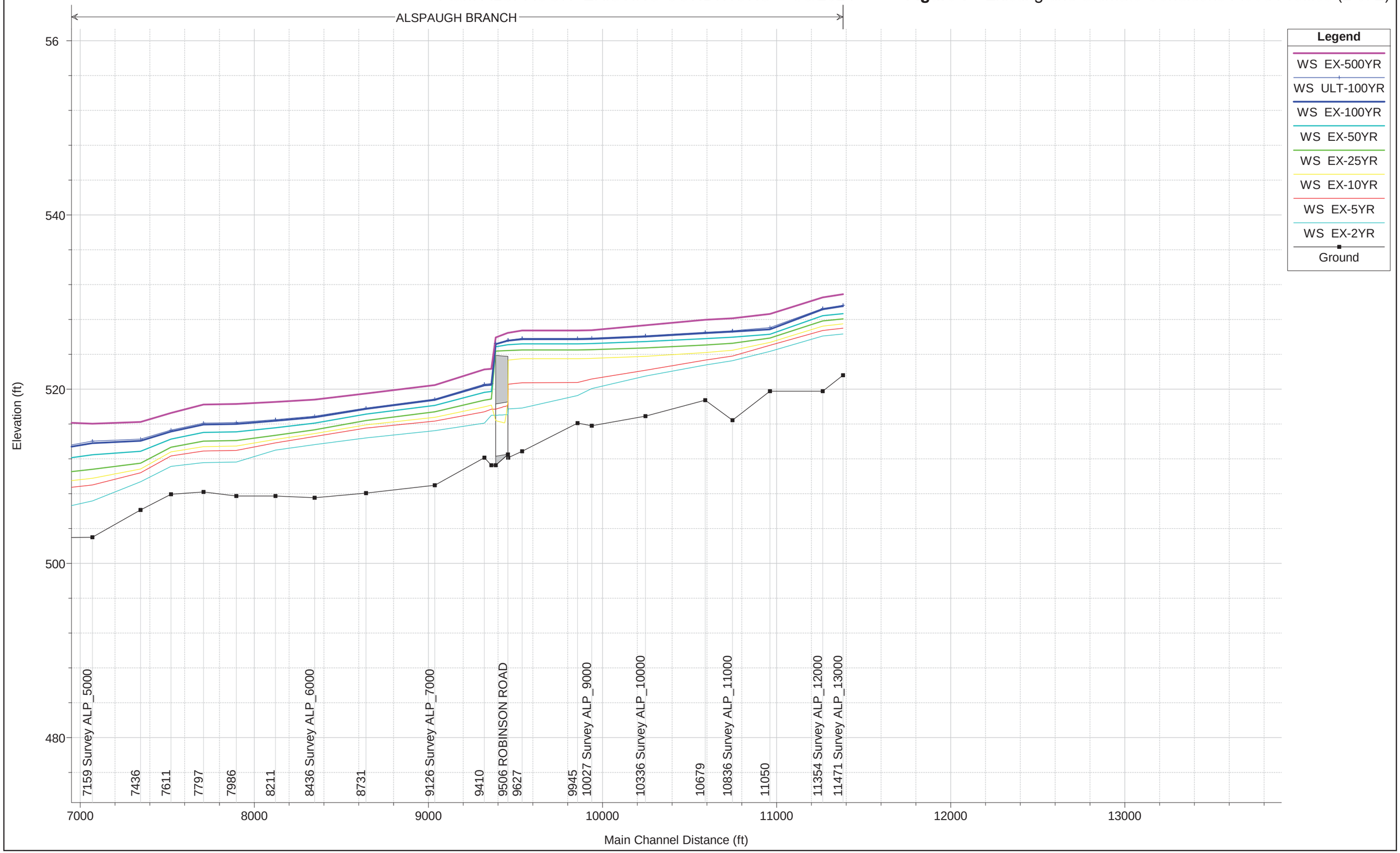
Plan: ALSPAUGH>EXISTING CONDITIONS 4/3/2014 **Figure 7** - Existing and Ultimate Conditions Flood Profiles (1 of 2)



1 in Horiz. = 500 ft 1 in Vert. = 10 ft

Plan: ALSPAUGH>EXISTING CONDITIONS 4/3/2014

Figure 7 - Existing and Ultimate Conditions Flood Profiles (2 of 2)



1 in Horiz. = 500 ft 1 in Vert. = 10 ft

Appendix B

Time of Concentration Table for Alspaugh Branch (Y#0948)

Alspaugh Branch Tc Summary Table

Basin	T_c (min)	Overland (min)	Shallow (min)	Channel (min)	T_{lag} (min)
A-01	23.88	3.91	12.39	7.57	14.33
A-02	10.70	2.40	7.02	1.28	6.42
A-03	8.88	3.12	4.41	1.34	5.33
A-04 (EX)	19.59	12.84	0.68	6.07	11.76
A-04 (ULT)	15.43	8.82	0.54	6.07	9.26
A-05	11.74	6.03	3.53	2.18	7.05
A-06 (EX)	15.53	4.47	8.62	2.44	9.32
A-06 (ULT)	13.65	3.26	7.94	2.44	8.19
A-07	6.07	5.75	0.33	0.00	3.64
A-08	16.28	10.54	5.07	0.67	9.77
A-09 (EX)	27.10	5.59	11.38	10.13	16.26
A-09 (ULT)	25.98	3.84	13.83	8.31	15.59
A-10	25.38	3.84	13.33	8.22	15.23
A-11	18.62	6.68	2.61	9.33	11.17
A-12	44.64	5.07	36.98	2.59	26.78
A-13	12.15	8.51	3.64	0.00	7.29
A-14	16.52	8.82	2.06	5.63	9.91
A-15	15.06	7.46	3.52	4.08	9.04
A-16	16.84	8.07	0.51	8.27	10.10
A-17	12.27	6.68	2.56	3.03	7.36
A-18A	23.51	15.35	4.23	3.92	14.10
A-18B (EX)	36.30	22.36	11.88	2.06	21.78
A-18B (ULT)	26.84	15.35	9.43	2.06	16.10
A-19A	31.22	7.38	14.06	9.78	18.73
A-19B	29.34	7.38	6.62	15.34	17.60
A-20 (EX)	38.30	9.73	21.69	6.88	22.98
A-20 (ULT)	30.77	6.68	17.21	6.88	18.46
A-21	12.57	4.39	3.80	4.38	7.54
A-22	10.34	5.68	3.45	1.21	6.21
A-23	21.27	7.82	4.88	8.57	12.76
A-24	14.84	5.59	7.38	1.87	8.90

NOTES:	
	Flow Types Include: (1) Overland, (2) Shallow, and (3) Channel
	The TR-55 equations and curves for estimating the time of concentration for overland/sheet flow, shallow concentrated flow, and channel flow were used for each individual subbasin
	Overland/Sheet Flow - $T_c = 0.007(nL)^{0.8}/(P_2)^{0.5}(S)^{0.4}$ - 2010 ISWM Technical Manual Equation 2.1.10; Overland/Sheet Flow not to exceed 50 feet
	Shallow Concentrated Flow - Paved - $V = 20.33(S)^{0.5}$ - 2010 ISWM Technical Manual Equation 2.1.12
	Shallow Concentrated Flow - Unpaved - $V = 16.33(S)^{0.5}$ - 2010 ISWM Technical Manual Equation 2.1.11
	Street/Gutter Flow - $Q = (0.56/n)S_x^{5/3}S^{1/2}T^{8/3}$ - 2010 ISWM Technical Manual Equation 3.2.1 (not used)
	Mannings n value for Street and Pavement Gutters - n = 0.015 - 2010 ISWM Technical Manual Table 1.2
	Channel Flow - Assumed design velocity of 6 fps unless variation justified based on slope and velocity in comparison to similar channels throughout DFW

Manual Entry
Calculated Value

Basin ID	Flow Type	n	Flow Length	Total Watercourse length	Start Elev	Stop Elev	S	Overland/Sheet	Shallow Concentrated Flow		Channel Flow	T_c (hrs)	T_c (min)	T_{Lag} (min)
								$P_{2\text{-}24hr}$	Paved/Unpaved	K	V (fps)			
A-01	Overland	0.150	32	3,946	569.00	568.50	0.016	3.95				0.07	3.91	2.35
A-01	Shallow		530		568.50	561.50	0.013		Unpaved	16.13		0.08	4.77	2.86
A-01	Shallow		658		561.50	559.00	0.005		Paved	20.33		0.13	7.63	4.58
A-01	Channel		2,726		559.00	533.00	0.010				6.00	0.13	7.57	4.54
A-02	Overland	0.150	50	1,305	560.00	553.50	0.130	3.95				0.04	2.40	1.44
A-02	Shallow		124		553.50	549.00	0.036		Unpaved	16.13		0.01	0.67	0.40
A-02	Shallow		669		549.00	544.00	0.007		Paved	20.33		0.11	6.34	3.81
A-02	Channel		462		544.00	533.00	0.024				6.00	0.02	1.28	0.77
A-03	Overland	0.150	36	1,033	558.00	556.75	0.035	3.95				0.05	3.12	1.87
A-03	Shallow		238		556.75	547.00	0.041		Unpaved	16.13		0.02	1.22	0.73
A-03	Shallow		276		547.00	546.00	0.005		Paved	20.33		0.05	3.20	1.92
A-03	Channel		483		546.00	533.00	0.027				6.00	0.02	1.34	0.81
A-04 (EX)	Overland	0.240	50	2,326	562.00	561.75	0.005	3.95				0.21	12.84	7.71
A-04 (EX)	Shallow		91		561.75	560.00	0.019		Unpaved	16.13		0.01	0.68	0.41
A-04 (EX)	Shallow		0		560.00	560.00			Paved	20.33				
A-04 (EX)	Channel		2,185		560.00	533.00	0.012				6.00	0.10	6.07	3.64
A-04 (ULT)	Overland	0.150	50	2,326	562.00	561.75	0.005	3.95				0.15	8.82	5.29
A-04 (ULT)	Shallow		0		561.75	561.75			Unpaved	16.13				
A-04 (ULT)	Shallow		91		561.75	560.00	0.019		Paved	20.33		0.01	0.54	0.32
A-04 (ULT)	Channel		2,185		560.00	533.00	0.012				6.00	0.10	6.07	3.64
A-05	Overland	0.150	81	1,213	548.00	545.25	0.034	3.95				0.10	6.03	3.62
A-05	Shallow		0		545.25	545.25			Unpaved	16.13				
A-05	Shallow		347		545.25	543.00	0.006		Paved	20.33		0.06	3.53	2.12
A-05	Channel		785		543.00	533.00	0.013				6.00	0.04	2.18	1.31
A-06 (EX)	Overland	0.240	50	2,047	563.00	559.50	0.070	3.95				0.07	4.47	2.68
A-06 (EX)	Shallow		461		559.50	552.00	0.016		Unpaved	16.13		0.06	3.73	2.24
A-06 (EX)	Shallow		657		552.00	544.00	0.012		Paved	20.33		0.08	4.88	2.93
A-06 (EX)	Channel		879		544.00	534.00	0.011				6.00	0.04	2.44	1.47

Basin ID	Flow Type	n	Flow Length	Total Watercourse length	Start Elev	Stop Elev	S	Overland/Sheet	Shallow Concentrated Flow		Channel Flow	T_c (hrs)	T_c (min)	T_{Lag} (min)
								$P_{2\text{-}24hr}$	Paved/Unpaved	K	V (fps)			
A-06 (ULT)	Overland	0.150	50	2,047	563.00	560.00	0.060	3.95				0.05	3.26	1.96
A-06 (ULT)	Shallow		150		560.00	557.00	0.020		Unpaved	16.13		0.02	1.10	0.66
A-06 (ULT)	Shallow		968		557.00	544.00	0.013		Paved	20.33		0.11	6.85	4.11
A-06 (ULT)	Channel		879		544.00	534.00	0.011				6.00	0.04	2.44	1.47
A-07	Overland	0.150	70	176	547.00	545.00	0.029	3.95				0.10	5.75	3.45
A-07	Shallow		106		545.00	533.00	0.113		Unpaved	16.13		0.01	0.33	0.20
A-07	Shallow		0		533.00	533.00			Paved	20.33				
A-07	Channel		0		533.00	533.00					6.00	0.00	0.00	0.00
A-08	Overland	0.150	125	921	547.00	544.50	0.020	3.95				0.18	10.54	6.33
A-08	Shallow		0		544.50	544.50			Unpaved	16.13				
A-08	Shallow		556		544.50	540.00	0.008		Paved	20.33		0.08	5.07	3.04
A-08	Channel		240		540.00	533.00	0.029				6.00	0.01	0.67	0.40
A-09 (EX)	Overland	0.240	50	4,263	561.00	559.00	0.040	3.95				0.09	5.59	3.35
A-09 (EX)	Shallow		1,221		559.00	544.00	0.012		Unpaved	16.13		0.19	11.38	6.83
A-09 (EX)	Channel		655		544.00	542.00	0.005				3.00	0.06	3.64	2.18
A-09 (EX)	Channel		2,337		542.00	533.00	0.005				6.00	0.11	6.49	3.90
A-09 (ULT)	Overland	0.150	50	4,263	540.00	538.00	0.040	3.95				0.06	3.84	2.30
A-09 (ULT)	Shallow		180		538.00	536.00	0.011		Unpaved	16.13		0.03	1.76	1.06
A-09 (ULT)	Shallow		1,041		536.00	536.00	0.005		Paved	20.33		0.20	12.07	7.24
A-09 (ULT)	Channel		2,992		536.00	522.00	0.005				6.00	0.14	8.31	4.99
A-10	Overland	0.150	50	3,921	540.00	538.00	0.040	3.95				0.06	3.84	2.30
A-10	Shallow		912		538.00	536.00	0.005		Unpaved	16.13		0.22	13.33	8.00
A-10	Shallow		0		536.00	536.00			Paved	20.33				
A-10	Channel		2,959		536.00	522.00	0.005				6.00	0.14	8.22	4.93
A-11	Overland	0.150	63	3,646	540.00	539.00	0.016	3.95				0.11	6.68	4.01
A-11	Shallow		0		539.00	539.00			Unpaved	16.13				
A-11	Shallow		225		539.00	538.00	0.005		Paved	20.33		0.04	2.61	1.57
A-11	Channel		3,358		538.00	522.00	0.005				6.00	0.16	9.33	5.60
A-12	Overland	0.150	50	3,513	539.00	538.00	0.020	3.95				0.08	5.07	3.04
A-12	Shallow		2,531		538.00	532.00	0.005		Unpaved	16.13		0.62	36.98	22.19
A-12	Shallow		0		532.00	532.00			Paved	20.33				
A-12	Channel		932		532.00	522.00	0.011				6.00	0.04	2.59	1.55
A-13	Overland	0.150	70	688	534.75	534.00	0.011	3.95				0.14	8.51	5.11
A-13	Shallow		0		534.00	534.00			Unpaved	16.13				
A-13	Shallow		618		534.00	522.00	0.019		Paved	20.33		0.06	3.64	2.18
A-13	Channel		0		522.00	522.00					6.00	0.00	0.00	0.00

Basin ID	Flow Type	n	Flow Length	Total Watercourse length	Start Elev	Stop Elev	S	Overland/Sheet	Shallow Concentrated Flow		Channel Flow	T_c (hrs)	T_c (min)	T_{Lag} (min)
								$P_{2\text{-}24hr}$	Paved/Unpaved	K	V (fps)			
A-14	Overland	0.150	100	2,313	534.00	532.00	0.020	3.95				0.15	8.82	5.29
A-14	Shallow		0		532.00	532.00			Unpaved	16.13				
A-14	Shallow		185		532.00	531.00	0.005		Paved	20.33		0.03	2.06	1.24
A-14	Channel		2,028		531.00	520.00	0.005				6.00	0.09	5.63	3.38
A-15	Overland	0.150	87	1,888	536.00	534.00	0.023	3.95				0.12	7.46	4.48
A-15	Shallow		0		534.00	534.00			Unpaved	16.13				
A-15	Shallow		333		534.00	532.00	0.006		Paved	20.33		0.06	3.52	2.11
A-15	Channel		1,468		532.00	519.00	0.009				6.00	0.07	4.08	2.45
A-16	Overland	0.150	100	1,836	534.00	531.50	0.025	3.95				0.13	8.07	4.84
A-16	Shallow		83		531.50	530.00	0.018		Paved	20.33		0.01	0.51	0.30
A-16	Channel		1,323		530.00	522.00	0.006				3.00	0.12	7.35	4.41
A-16	Channel		330		522.00	519.00	0.009				6.00	0.02	0.92	0.55
A-17	Overland	0.150	63	1,442	532.50	531.50	0.016	3.95				0.11	6.68	4.01
A-17	Shallow		0		531.50	531.50			Unpaved	16.13				
A-17	Shallow		290		531.50	529.00	0.009		Paved	20.33		0.04	2.56	1.54
A-17	Channel		1,089		529.00	513.00	0.015				6.00	0.05	3.03	1.82
A-18A	Overland	0.150	100	1,920	534.50	534.00	0.005	3.95				0.26	15.35	9.21
A-18A	Shallow		275		534.00	532.00	0.007		Unpaved	16.13		0.06	3.33	2.00
A-18A	Shallow		134		532.00	530.00	0.015		Paved	20.33		0.01	0.90	0.54
A-18A	Channel		1,411		530.00	513.00	0.012				6.00	0.07	3.92	2.35
A-18B (EX)	Overland	0.240	100	1,655	530.50	530.00	0.005	3.95				0.37	22.36	13.42
A-18B (EX)	Shallow		813		530.00	528.00	0.005		Unpaved	16.13		0.20	11.88	7.13
A-18B (EX)	Shallow		0		528.00	528.00			Paved	20.33				
A-18B (EX)	Channel		742		528.00	508.00	0.027				6.00	0.03	2.06	1.24
A-18B (ULT)	Overland	0.150	100	1,655	530.50	530.00	0.005	3.95				0.26	15.35	9.21
A-18B (ULT)	Shallow		0		530.00	530.00			Unpaved	16.13				
A-18B (ULT)	Shallow		813		530.00	528.00	0.005		Paved	20.33		0.16	9.43	5.66
A-18B (ULT)	Channel		742		528.00	508.00	0.027				6.00	0.03	2.06	1.24
A-19A	Overland	0.240	50	4,710	549.00	548.00	0.020	3.95				0.12	7.38	4.43
A-19A	Shallow		1,140		548.00	540.00	0.007		Unpaved	16.13		0.23	14.06	8.44
A-19A	Shallow		0		540.00	540.00			Paved	20.33				
A-19A	Channel		3,520		540.00	532.50	0.005				6.00	0.16	9.78	5.87
A-19B	Overland	0.240	50	6,200	539.00	538.00	0.020	3.95				0.12	7.38	4.43
A-19B	Shallow		627		538.00	532.00	0.010		Unpaved	16.13		0.11	6.62	3.97
A-19B	Shallow		0		532.00	532.00			Paved	20.33				
A-19B	Channel		5,523		532.00	509.00	0.005				6.00	0.26	15.34	9.21

Basin ID	Flow Type	n	Flow Length	Total Watercourse length	Start Elev	Stop Elev	S	Overland/Sheet	Shallow Concentrated Flow		Channel Flow	T_c (hrs)	T_c (min)	T_{Lag} (min)
								$P_{2\text{-}24hr}$	Paved/Unpaved	K	V (fps)			
A-20 (EX)	Overland	0.240	50	4,360	530.50	530.00	0.010	3.95				0.16	9.73	5.84
A-20 (EX)	Shallow		1,834		530.00	516.00	0.008		Unpaved	16.13		0.36	21.69	13.01
A-20 (EX)	Shallow		0		516.00	516.00			Paved	20.33				
A-20 (EX)	Channel		2,476		516.00	487.00	0.012				6.00	0.11	6.88	4.13
A-20 (ULT)	Overland	0.150	50	4,360	530.50	530.00	0.010	3.95				0.11	6.68	4.01
A-20 (ULT)	Shallow		0		530.00	530.00			Unpaved	16.13				
A-20 (ULT)	Shallow		1,834		530.00	516.00	0.008		Paved	20.33		0.29	17.21	10.33
A-20 (ULT)	Channel		2,476		516.00	487.00	0.012				6.00	0.11	6.88	4.13
A-21	Overland	0.150	64	1,992	526.00	523.00	0.047	3.95				0.07	4.39	2.63
A-21	Shallow		0		523.00	523.00			Unpaved	16.13				
A-21	Shallow		350		523.00	521.00	0.006		Paved	20.33		0.06	3.80	2.28
A-21	Channel		1,578		521.00	488.00	0.021				6.00	0.07	4.38	2.63
A-22	Overland	0.150	50	1,243	518.75	518.00	0.015	3.95				0.09	5.68	3.41
A-22	Shallow		758		518.00	479.00	0.051		Unpaved	16.13		0.06	3.45	2.07
A-22	Shallow		0		479.00	479.00			Paved	20.33				
A-22	Channel		435		479.00	478.00	0.005				6.00	0.02	1.21	0.73
A-23	Overland	0.150	57	3,588	524.50	524.00	0.009	3.95				0.13	7.82	4.69
A-23	Shallow		447		524.00	520.00	0.009		Unpaved	16.13		0.08	4.88	2.93
A-23	Shallow		0		520.00	520.00			Paved	20.33				
A-23	Channel		3,084		520.00	475.00	0.015				6.00	0.14	8.57	5.14
A-24	Overland	0.240	50	2,052	510.00	508.00	0.040	3.95				0.09	5.59	3.35
A-24	Shallow		1,329		508.00	462.00	0.035		Unpaved	16.13		0.12	7.38	4.43
A-24	Shallow		0		462.00	462.00			Paved	20.33				
A-24	Channel		673		462.00	458.00	0.006				6.00	0.03	1.87	1.12

Appendix C.1

HEC-HMS v3.5 Results for Alspaugh Branch (Y#0948)

AECOM

Project: AlspaughBranch Simulation Run: EX 002YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh EX - 002YR
End of Run: 02Jan2012, 00:02 Meteorologic Model: 50% ACE
Compute Time: 03Apr2014, 14:13:42 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
PondPack Discharge	0.9230	400.9	01Jan2012, 12:34	2.58314
J-01	0.9230	400.9	01Jan2012, 12:34	2.58314
Reach-06	0.9230	400.3	01Jan2012, 12:36	2.58027
A-14	0.0438	95.7	01Jan2012, 12:02	3.19209
A-15	0.0350	83.1	01Jan2012, 12:02	3.38184
J-02	1.0018	423.2	01Jan2012, 12:34	2.63502
Reach-07	1.0018	208.0	01Jan2012, 00:02	7.72700
A-16	0.0261	56.0	01Jan2012, 12:02	3.15667
J-03	1.0279	264.0	01Jan2012, 12:02	7.61095
Reach-08	1.0279	262.7	01Jan2012, 12:06	7.60175
A-17	0.0259	59.2	01Jan2012, 12:00	2.96166
J-04	1.0538	315.8	01Jan2012, 12:02	7.48771
A-18A	0.0215	35.7	01Jan2012, 12:06	2.74302
J-05	1.0753	348.8	01Jan2012, 12:04	7.39284
Reach-09	1.0753	346.5	01Jan2012, 12:06	7.57397
A-18B	0.0412	49.2	01Jan2012, 12:14	2.46479
J-06	1.1165	386.8	01Jan2012, 12:08	7.38544
Reach-10A	1.1165	385.6	01Jan2012, 12:08	7.37423
A-19A	0.1477	185.6	01Jan2012, 12:12	2.33553
Junction-A	0.1477	185.6	01Jan2012, 12:12	2.33553
Reach-15	0.1477	180.6	01Jan2012, 12:28	2.31499
A-19B	0.1022	121.3	01Jan2012, 12:10	2.05455
Junction-B	0.2499	247.8	01Jan2012, 12:24	2.20848
J-07	1.3664	556.6	01Jan2012, 12:20	6.42947
Reach-10	1.3664	549.0	01Jan2012, 12:28	6.37388
A-20	0.1619	169.1	01Jan2012, 12:16	2.16158

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
J-08	1.5283	692.7	01Jan2012, 12:20	5.92765
Reach 11	1.5283	668.6	01Jan2012, 12:38	5.89035
A-21	0.0419	96.8	01Jan2012, 12:00	3.03496
J-09	1.5702	677.9	01Jan2012, 12:38	5.81416
Reach-12	1.5702	672.0	01Jan2012, 12:44	5.78399
A-22	0.0315	66.0	01Jan2012, 12:00	2.45439
J-10	1.6017	677.4	01Jan2012, 12:44	5.71850
Reach-13	1.6017	675.7	01Jan2012, 12:46	5.71142
A-23	0.0444	79.8	01Jan2012, 12:06	2.84562
j-11	1.6461	686.1	01Jan2012, 12:46	5.63412
Reach-14	1.6461	677.7	01Jan2012, 12:54	5.60696
J-12	1.6461	677.7	01Jan2012, 12:54	5.60696
A-24	0.0177	28.8	01Jan2012, 12:02	2.13012
OUTFALL	1.6638	680.2	01Jan2012, 12:54	5.56998

Project: AlspaughBranch Simulation Run: EX 005YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh EX - 005YR
End of Run: 02Jan2012, 00:02 Meteorologic Model: 20% ACE
Compute Time: 03Apr2014, 14:13:45 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
A-14	0.0438	137.6	01Jan2012, 12:02	4.55985
A-15	0.0350	117.7	01Jan2012, 12:02	4.76989
A-16	0.0261	80.7	01Jan2012, 12:02	4.52063
A-17	0.0259	86.7	01Jan2012, 12:00	4.30572
A-18A	0.0215	53.4	01Jan2012, 12:06	4.06215
A-18B	0.0412	75.6	01Jan2012, 12:14	3.75235
A-19A	0.1477	289.1	01Jan2012, 12:12	3.61025
A-19B	0.1022	196.0	01Jan2012, 12:10	3.29984
A-20	0.1619	269.5	01Jan2012, 12:16	3.41666
A-21	0.0419	140.8	01Jan2012, 12:00	4.38672
A-22	0.0315	100.9	01Jan2012, 12:00	3.74515
A-23	0.0444	117.9	01Jan2012, 12:06	4.17598
A-24	0.0177	46.0	01Jan2012, 12:02	3.35024
Junction-04	0.9230	618.5	01Jan2012, 12:26	3.90963
Junction-05	1.0018	658.4	01Jan2012, 12:28	3.96454
Junction-06	1.0279	661.9	01Jan2012, 12:34	8.57884
Junction-07	1.0538	663.6	01Jan2012, 12:38	8.46483
Junction-07B	1.0753	674.3	01Jan2012, 12:38	8.37680
Junction-08A	1.1165	724.4	01Jan2012, 12:24	8.34581
Junction-08B	1.3664	1115.7	01Jan2012, 12:24	7.44438
Junction-09	1.5283	1262.7	01Jan2012, 12:30	6.96728
Junction-10	1.5702	1221.7	01Jan2012, 12:44	6.86131
Junction-11	1.6017	1214.6	01Jan2012, 12:50	6.76972
Junction-12	1.6461	1225.1	01Jan2012, 12:50	6.69269
Junction-13	1.6461	1220.0	01Jan2012, 12:54	6.66478
Junction-A	0.1477	289.1	01Jan2012, 12:12	3.61025

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-B	0.2499	403.3	01Jan2012, 12:22	3.46713
OUTFALL	1.6638	1223.9	01Jan2012, 12:54	6.62952
PondPack Discharge	0.9230	618.5	01Jan2012, 12:26	3.90963
Reach-06	0.9230	616.6	01Jan2012, 12:30	3.90575
Reach-07	1.0018	650.3	01Jan2012, 12:34	8.68457
Reach-08	1.0279	655.8	01Jan2012, 12:40	8.56962
Reach-09	1.0753	673.9	01Jan2012, 12:40	8.52181
Reach-10	1.3664	1088.5	01Jan2012, 12:32	7.38798
Reach-10A	1.1165	723.4	01Jan2012, 12:26	8.33458
Reach 11	1.5283	1210.1	01Jan2012, 12:44	6.92915
Reach-12	1.5702	1207.2	01Jan2012, 12:50	6.83040
Reach-13	1.6017	1211.7	01Jan2012, 12:50	6.76246
Reach-14	1.6461	1220.0	01Jan2012, 12:54	6.66478
Reach-15	0.1477	281.6	01Jan2012, 12:26	3.58290

Project: AlspaughBranch Simulation Run: EX 010YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh EX - 010YR
End of Run: 02Jan2012, 00:02 Meteorologic Model: 10% ACE
Compute Time: 03Apr2014, 14:13:48 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
A-14	0.0438	166.8	01Jan2012, 12:02	5.51907
A-15	0.0350	141.8	01Jan2012, 12:02	5.73908
A-16	0.0261	98.0	01Jan2012, 12:02	5.47798
A-17	0.0259	105.9	01Jan2012, 12:00	5.25354
A-18A	0.0215	65.7	01Jan2012, 12:06	4.99732
A-18B	0.0412	94.3	01Jan2012, 12:14	4.67153
A-19A	0.1477	362.4	01Jan2012, 12:10	4.52337
A-19B	0.1022	249.0	01Jan2012, 12:10	4.19866
A-20	0.1619	340.5	01Jan2012, 12:16	4.31988
A-21	0.0419	171.5	01Jan2012, 12:00	5.33830
A-22	0.0315	125.4	01Jan2012, 12:00	4.66701
A-23	0.0444	144.5	01Jan2012, 12:06	5.11673
A-24	0.0177	58.3	01Jan2012, 12:02	4.23470
Junction-04	0.9230	813.1	01Jan2012, 12:24	4.84152
Junction-05	1.0018	870.4	01Jan2012, 12:24	4.89794
Junction-06	1.0279	868.2	01Jan2012, 12:30	9.06384
Junction-07	1.0538	860.5	01Jan2012, 12:38	8.96120
Junction-07B	1.0753	873.5	01Jan2012, 12:38	8.88194
Junction-08A	1.1165	912.6	01Jan2012, 12:38	8.84671
Junction-08B	1.3664	1370.2	01Jan2012, 12:22	8.01913
Junction-09	1.5283	1614.7	01Jan2012, 12:26	7.57633
Junction-10	1.5702	1573.1	01Jan2012, 12:40	7.47894
Junction-11	1.6017	1566.3	01Jan2012, 12:46	7.39285
Junction-12	1.6461	1580.4	01Jan2012, 12:48	7.32426
Junction-13	1.6461	1577.2	01Jan2012, 12:50	7.29583
Junction-A	0.1477	362.4	01Jan2012, 12:10	4.52337

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-B	0.2499	514.0	01Jan2012, 12:20	4.37191
OUTFALL	1.6638	1582.2	01Jan2012, 12:50	7.26327
PondPack Discharge	0.9230	813.1	01Jan2012, 12:24	4.84152
Reach-06	0.9230	810.3	01Jan2012, 12:26	4.83657
Reach-07	1.0018	852.3	01Jan2012, 12:32	9.15726
Reach-08	1.0279	850.8	01Jan2012, 12:38	9.05462
Reach-09	1.0753	872.5	01Jan2012, 12:40	9.00668
Reach-10	1.3664	1355.2	01Jan2012, 12:30	7.96218
Reach-10A	1.1165	911.7	01Jan2012, 12:38	8.83547
Reach 11	1.5283	1558.0	01Jan2012, 12:40	7.53763
Reach-12	1.5702	1556.8	01Jan2012, 12:46	7.44753
Reach-13	1.6017	1563.2	01Jan2012, 12:48	7.38546
Reach-14	1.6461	1577.2	01Jan2012, 12:50	7.29583
Reach-15	0.1477	353.8	01Jan2012, 12:24	4.49179

Project: AlspaughBranch Simulation Run: EX 025YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh EX - 025YR
End of Run: 02Jan2012, 00:02 Meteorologic Model: 04% ACE
Compute Time: 03Apr2014, 14:13:51 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
A-14	0.0438	199.0	01Jan2012, 12:02	6.58362
A-15	0.0350	168.3	01Jan2012, 12:02	6.81223
A-16	0.0261	117.0	01Jan2012, 12:02	6.54092
A-17	0.0259	127.0	01Jan2012, 12:00	6.30848
A-18A	0.0215	79.5	01Jan2012, 12:06	6.04102
A-18B	0.0412	115.0	01Jan2012, 12:14	5.70106
A-19A	0.1477	444.0	01Jan2012, 12:10	5.54790
A-19B	0.1022	307.8	01Jan2012, 12:10	5.21100
A-20	0.1619	419.5	01Jan2012, 12:14	5.33567
A-21	0.0419	205.4	01Jan2012, 12:00	6.39644
A-22	0.0315	152.4	01Jan2012, 12:00	5.69977
A-23	0.0444	174.0	01Jan2012, 12:06	6.16528
A-24	0.0177	71.9	01Jan2012, 12:02	5.23380
Junction-04	0.9230	1105.1	01Jan2012, 12:20	5.86735
Junction-05	1.0018	1175.8	01Jan2012, 12:22	5.92584
Junction-06	1.0279	1179.9	01Jan2012, 12:26	9.67158
Junction-07	1.0538	1169.2	01Jan2012, 12:30	9.57991
Junction-07B	1.0753	1191.9	01Jan2012, 12:30	9.50916
Junction-08A	1.1165	1247.7	01Jan2012, 12:32	9.47096
Junction-08B	1.3664	1722.5	01Jan2012, 12:32	8.71517
Junction-09	1.5283	1980.9	01Jan2012, 12:26	8.30570
Junction-10	1.5702	2016.4	01Jan2012, 12:28	8.21648
Junction-11	1.6017	1989.8	01Jan2012, 12:38	8.13565
Junction-12	1.6461	2013.4	01Jan2012, 12:40	8.07518
Junction-13	1.6461	2001.6	01Jan2012, 12:44	8.04618
Junction-A	0.1477	444.0	01Jan2012, 12:10	5.54790

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-B	0.2499	640.8	01Jan2012, 12:20	5.38875
OUTFALL	1.6638	2008.4	01Jan2012, 12:44	8.01626
PondPack Discharge	0.9230	1105.1	01Jan2012, 12:20	5.86735
Reach-06	0.9230	1090.3	01Jan2012, 12:22	5.86102
Reach-07	1.0018	1156.0	01Jan2012, 12:26	9.75314
Reach-08	1.0279	1154.0	01Jan2012, 12:30	9.66235
Reach-09	1.0753	1183.2	01Jan2012, 12:32	9.61541
Reach-10	1.3664	1704.4	01Jan2012, 12:36	8.65761
Reach-10A	1.1165	1237.2	01Jan2012, 12:34	9.45971
Reach 11	1.5283	1989.2	01Jan2012, 12:28	8.26638
Reach-12	1.5702	1976.8	01Jan2012, 12:38	8.18452
Reach-13	1.6017	1986.7	01Jan2012, 12:40	8.12812
Reach-14	1.6461	2001.6	01Jan2012, 12:44	8.04618
Reach-15	0.1477	432.7	01Jan2012, 12:24	5.51174

Project: AlspaughBranch Simulation Run: EX 050YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh EX - 050YR
End of Run: 02Jan2012, 00:02 Meteorologic Model: 02% ACE
Compute Time: 03Apr2014, 14:13:55 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
A-14	0.0438	228.9	01Jan2012, 12:02	7.57696
A-15	0.0350	192.9	01Jan2012, 12:02	7.81198
A-16	0.0261	134.7	01Jan2012, 12:02	7.53306
A-17	0.0259	146.7	01Jan2012, 12:00	7.29481
A-18A	0.0215	92.2	01Jan2012, 12:06	7.01870
A-18B	0.0412	134.3	01Jan2012, 12:14	6.66787
A-19A	0.1477	519.9	01Jan2012, 12:10	6.51116
A-19B	0.1022	362.5	01Jan2012, 12:10	6.16529
A-20	0.1619	493.4	01Jan2012, 12:14	6.29223
A-21	0.0419	236.9	01Jan2012, 12:00	7.38514
A-22	0.0315	177.5	01Jan2012, 12:00	6.66974
A-23	0.0444	201.4	01Jan2012, 12:06	7.14663
A-24	0.0177	84.7	01Jan2012, 12:02	6.17783
Junction-04	0.9230	1428.2	01Jan2012, 12:18	6.82843
Junction-05	1.0018	1519.9	01Jan2012, 12:20	6.88873
Junction-06	1.0279	1545.5	01Jan2012, 12:22	10.37668
Junction-07	1.0538	1559.3	01Jan2012, 12:26	10.29192
Junction-07B	1.0753	1591.7	01Jan2012, 12:26	10.22648
Junction-08A	1.1165	1681.7	01Jan2012, 12:26	10.18488
Junction-08B	1.3664	2344.4	01Jan2012, 12:26	9.47360
Junction-09	1.5283	2589.8	01Jan2012, 12:32	9.08462
Junction-10	1.5702	2599.4	01Jan2012, 12:36	9.00043
Junction-11	1.6017	2589.1	01Jan2012, 12:40	8.92277
Junction-12	1.6461	2613.2	01Jan2012, 12:40	8.86741
Junction-13	1.6461	2606.5	01Jan2012, 12:44	8.83789
Junction-A	0.1477	519.9	01Jan2012, 12:10	6.51116

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-B	0.2499	757.7	01Jan2012, 12:20	6.34610
OUTFALL	1.6638	2614.4	01Jan2012, 12:44	8.80959
PondPack Discharge	0.9230	1428.2	01Jan2012, 12:18	6.82843
Reach-06	0.9230	1417.6	01Jan2012, 12:22	6.82106
Reach-07	1.0018	1511.9	01Jan2012, 12:24	10.45077
Reach-08	1.0279	1538.8	01Jan2012, 12:26	10.36744
Reach-09	1.0753	1585.9	01Jan2012, 12:28	10.31963
Reach-10	1.3664	2285.0	01Jan2012, 12:32	9.41548
Reach-10A	1.1165	1678.3	01Jan2012, 12:28	10.17361
Reach 11	1.5283	2576.3	01Jan2012, 12:36	9.04472
Reach-12	1.5702	2574.8	01Jan2012, 12:40	8.96797
Reach-13	1.6017	2582.5	01Jan2012, 12:40	8.91511
Reach-14	1.6461	2606.5	01Jan2012, 12:44	8.83789
Reach-15	0.1477	505.5	01Jan2012, 12:24	6.47122

Project: AlspaughBranch Simulation Run: EX 100YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh EX - 100YR
End of Run: 02Jan2012, 00:02 Meteorologic Model: 01% ACE
Compute Time: 03Apr2014, 14:13:58 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
A-14	0.0438	259.1	01Jan2012, 12:02	8.58444
A-15	0.0350	217.8	01Jan2012, 12:02	8.82482
A-16	0.0261	152.6	01Jan2012, 12:02	8.53953
A-17	0.0259	166.5	01Jan2012, 12:00	8.29659
A-18A	0.0215	105.1	01Jan2012, 12:06	8.01299
A-18B	0.0412	153.7	01Jan2012, 12:14	7.65279
A-19A	0.1477	596.6	01Jan2012, 12:10	7.49326
A-19B	0.1022	417.8	01Jan2012, 12:10	7.13999
A-20	0.1619	568.1	01Jan2012, 12:14	7.26858
A-21	0.0419	268.7	01Jan2012, 12:00	8.38887
A-22	0.0315	202.9	01Jan2012, 12:00	7.65798
A-23	0.0444	229.0	01Jan2012, 12:06	8.14403
A-24	0.0177	97.7	01Jan2012, 12:02	7.14382
Junction-04	0.9230	1880.3	01Jan2012, 12:22	7.79577
Junction-05	1.0018	1962.6	01Jan2012, 12:24	7.85847
Junction-06	1.0279	1988.6	01Jan2012, 12:26	11.07976
Junction-07	1.0538	2005.3	01Jan2012, 12:28	11.00234
Junction-07B	1.0753	2041.6	01Jan2012, 12:26	10.94257
Junction-08A	1.1165	2141.2	01Jan2012, 12:28	10.89956
Junction-08B	1.3664	2887.8	01Jan2012, 12:26	10.23618
Junction-09	1.5283	3184.7	01Jan2012, 12:32	9.86934
Junction-10	1.5702	3207.9	01Jan2012, 12:34	9.79043
Junction-11	1.6017	3175.6	01Jan2012, 12:40	9.71616
Junction-12	1.6461	3202.3	01Jan2012, 12:40	9.66618
Junction-13	1.6461	3194.9	01Jan2012, 12:44	9.63614
Junction-A	0.1477	596.6	01Jan2012, 12:10	7.49326

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-B	0.2499	877.7	01Jan2012, 12:18	7.32271
OUTFALL	1.6638	3203.8	01Jan2012, 12:44	9.60963
PondPack Discharge	0.9230	1880.3	01Jan2012, 12:22	7.79577
Reach-06	0.9230	1864.1	01Jan2012, 12:24	7.78738
Reach-07	1.0018	1957.7	01Jan2012, 12:26	11.14594
Reach-08	1.0279	1983.9	01Jan2012, 12:28	11.07051
Reach-09	1.0753	2037.9	01Jan2012, 12:28	11.02396
Reach-10	1.3664	2835.4	01Jan2012, 12:32	10.17749
Reach-10A	1.1165	2133.8	01Jan2012, 12:30	10.88828
Reach 11	1.5283	3179.9	01Jan2012, 12:34	9.82885
Reach-12	1.5702	3159.4	01Jan2012, 12:40	9.75745
Reach-13	1.6017	3167.5	01Jan2012, 12:40	9.70838
Reach-14	1.6461	3194.9	01Jan2012, 12:44	9.63614
Reach-15	0.1477	581.4	01Jan2012, 12:22	7.44914

Project: AlspaughBranch Simulation Run: EX 500YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh EX - 500YR
End of Run: 02Jan2012, 00:02 Meteorologic Model: .2% ACE
Compute Time: 03Apr2014, 14:14:02 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
A-14	0.0438	330.8	01Jan2012, 12:02	10.99294
A-15	0.0350	276.8	01Jan2012, 12:02	11.24303
A-16	0.0261	195.0	01Jan2012, 12:02	10.94620
A-17	0.0259	213.6	01Jan2012, 12:00	10.69527
A-18A	0.0215	135.6	01Jan2012, 12:06	10.39730
A-18B	0.0412	199.9	01Jan2012, 12:14	10.01920
A-19A	0.1477	778.8	01Jan2012, 12:10	9.85509
A-19B	0.1022	549.0	01Jan2012, 12:10	9.48876
A-20	0.1619	745.5	01Jan2012, 12:14	9.61950
A-21	0.0419	344.2	01Jan2012, 12:00	10.79101
A-22	0.0315	262.9	01Jan2012, 12:00	10.03261
A-23	0.0444	294.7	01Jan2012, 12:06	10.53408
A-24	0.0177	128.6	01Jan2012, 12:02	9.47697
Junction-04	0.9230	3282.4	01Jan2012, 12:18	10.13963
Junction-05	1.0018	3404.9	01Jan2012, 12:20	10.20576
Junction-06	1.0279	3445.1	01Jan2012, 12:22	12.89507
Junction-07	1.0538	3470.8	01Jan2012, 12:24	12.83196
Junction-07B	1.0753	3523.9	01Jan2012, 12:24	12.78328
Junction-08A	1.1165	3666.5	01Jan2012, 12:24	12.73778
Junction-08B	1.3664	4702.7	01Jan2012, 12:24	12.16821
Junction-09	1.5283	5183.6	01Jan2012, 12:28	11.84455
Junction-10	1.5702	5217.7	01Jan2012, 12:30	11.77570
Junction-11	1.6017	5078.8	01Jan2012, 12:38	11.70791
Junction-12	1.6461	5126.7	01Jan2012, 12:38	11.66838
Junction-13	1.6461	5118.0	01Jan2012, 12:40	11.63709
Junction-A	0.1477	778.8	01Jan2012, 12:10	9.85509

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-B	0.2499	1166.7	01Jan2012, 12:18	9.67399
OUTFALL	1.6638	5130.8	01Jan2012, 12:40	11.61411
PondPack Discharge	0.9230	3282.4	01Jan2012, 12:18	10.13963
Reach-06	0.9230	3253.5	01Jan2012, 12:22	10.12908
Reach-07	1.0018	3395.7	01Jan2012, 12:22	12.94584
Reach-08	1.0279	3438.7	01Jan2012, 12:24	12.88580
Reach-09	1.0753	3511.3	01Jan2012, 12:26	12.84194
Reach-10	1.3664	4641.0	01Jan2012, 12:28	12.10819
Reach-10A	1.1165	3660.0	01Jan2012, 12:26	12.72647
Reach 11	1.5283	5176.3	01Jan2012, 12:30	11.80270
Reach-12	1.5702	5057.1	01Jan2012, 12:38	11.74152
Reach-13	1.6017	5078.5	01Jan2012, 12:38	11.69982
Reach-14	1.6461	5118.0	01Jan2012, 12:40	11.63709
Reach-15	0.1477	759.0	01Jan2012, 12:22	9.80216

Project: AlspaughBranch Simulation Run: ULTEX 100YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh ULTEX - 100
End of Run: 02Jan2012, 00:02 Meteorologic Model: 01% ACE
Compute Time: 03Apr2014, 14:14:37 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
A-14	0.0438	259.1	01Jan2012, 12:02	8.58444
A-15	0.0350	217.8	01Jan2012, 12:02	8.82482
A-16	0.0261	152.6	01Jan2012, 12:02	8.53953
A-17	0.0259	166.5	01Jan2012, 12:00	8.29659
A-18A	0.0215	105.1	01Jan2012, 12:06	8.01299
A-18B	0.0412	153.7	01Jan2012, 12:14	7.65279
A-19A	0.1477	596.6	01Jan2012, 12:10	7.49326
A-19B	0.1022	417.8	01Jan2012, 12:10	7.13999
A-20	0.1619	568.1	01Jan2012, 12:14	7.26858
A-21	0.0419	268.7	01Jan2012, 12:00	8.38887
A-22	0.0315	202.9	01Jan2012, 12:00	7.65798
A-23	0.0444	229.0	01Jan2012, 12:06	8.14403
A-24	0.0177	97.7	01Jan2012, 12:02	7.14382
J-01	0.9230	1966.5	01Jan2012, 12:22	7.96417
J-02	1.0018	2051.1	01Jan2012, 12:24	8.01361
J-03	1.0279	2076.0	01Jan2012, 12:26	11.15384
J-04	1.0538	2096.6	01Jan2012, 12:26	11.07460
J-05	1.0753	2133.4	01Jan2012, 12:26	11.01338
J-06	1.1165	2232.3	01Jan2012, 12:28	10.96771
J-07	1.3664	2989.7	01Jan2012, 12:26	10.29187
J-08	1.5283	3286.7	01Jan2012, 12:30	9.91913
J-09	1.5702	3306.1	01Jan2012, 12:34	9.83889
J-10	1.6017	3273.2	01Jan2012, 12:40	9.76367
J-11	1.6461	3301.0	01Jan2012, 12:40	9.71241
J-12	1.6461	3292.0	01Jan2012, 12:42	9.68237
Junction-A	0.1477	596.6	01Jan2012, 12:10	7.49326

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-B	0.2499	877.7	01Jan2012, 12:18	7.32271
OUTFALL	1.6638	3301.4	01Jan2012, 12:42	9.65536
PondPack Discharge	0.9230	1966.5	01Jan2012, 12:22	7.96417
Reach-06	0.9230	1952.6	01Jan2012, 12:24	7.95576
Reach-07	1.0018	2045.1	01Jan2012, 12:26	11.22196
Reach-08	1.0279	2073.5	01Jan2012, 12:26	11.14460
Reach-09	1.0753	2129.0	01Jan2012, 12:28	11.09472
Reach-10	1.3664	2935.4	01Jan2012, 12:32	10.23318
Reach-10A	1.1165	2229.0	01Jan2012, 12:28	10.95644
Reach 11	1.5283	3278.1	01Jan2012, 12:34	9.87864
Reach-12	1.5702	3257.0	01Jan2012, 12:40	9.80591
Reach-13	1.6017	3266.3	01Jan2012, 12:40	9.75589
Reach-14	1.6461	3292.0	01Jan2012, 12:42	9.68237
Reach-15	0.1477	581.4	01Jan2012, 12:22	7.44914

Project: AlspaughBranch Simulation Run: PROP 002YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh PROP - 002Y
End of Run: 02Jan2012, 00:02 Meteorologic Model: 50% ACE
Compute Time: 03Apr2014, 14:14:05 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
A-14	0.0438	95.7	01Jan2012, 12:02	3.19209
A-15	0.0350	83.1	01Jan2012, 12:02	3.38184
A-16	0.0261	56.0	01Jan2012, 12:02	3.15667
A-17	0.0259	59.2	01Jan2012, 12:00	2.96166
A-18A	0.0215	35.7	01Jan2012, 12:06	2.74302
A-18B	0.0412	49.2	01Jan2012, 12:14	2.46479
A-19A	0.1477	185.6	01Jan2012, 12:12	2.33553
A-19B	0.1022	121.3	01Jan2012, 12:10	2.05455
A-20	0.1619	169.1	01Jan2012, 12:16	2.16158
A-21	0.0419	96.8	01Jan2012, 12:00	3.03496
A-22	0.0315	66.0	01Jan2012, 12:00	2.45439
A-23	0.0444	79.8	01Jan2012, 12:06	2.84562
A-24	0.0177	28.8	01Jan2012, 12:02	2.13012
J-01	0.9230	400.9	01Jan2012, 12:34	2.58314
J-02	1.0018	421.9	01Jan2012, 12:34	2.63561
J-03	1.0279	428.2	01Jan2012, 12:36	2.64653
J-04	1.0538	432.7	01Jan2012, 12:40	2.65275
J-05	1.0753	439.4	01Jan2012, 12:40	2.65455
J-06	1.1165	458.9	01Jan2012, 12:40	2.64439
J-07	1.3664	676.1	01Jan2012, 12:26	2.56332
J-08	1.5283	787.2	01Jan2012, 12:28	2.51300
J-09	1.5702	792.4	01Jan2012, 12:34	2.52166
J-10	1.6017	784.0	01Jan2012, 12:42	2.51531
j-11	1.6461	793.5	01Jan2012, 12:44	2.52272
J-12	1.6461	790.4	01Jan2012, 12:48	2.51647
Junction-A	0.1477	185.6	01Jan2012, 12:12	2.33553

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-B	0.2499	247.8	01Jan2012, 12:24	2.20848
OUTFALL	1.6638	793.2	01Jan2012, 12:48	2.51236
PondPack Discharge	0.9230	400.9	01Jan2012, 12:34	2.58314
Reach-06	0.9230	400.0	01Jan2012, 12:38	2.58091
Reach-07	1.0018	421.3	01Jan2012, 12:38	2.63324
Reach-08	1.0279	427.4	01Jan2012, 12:40	2.64496
Reach-09	1.0753	439.1	01Jan2012, 12:42	2.65127
Reach-10	1.3664	672.0	01Jan2012, 12:34	2.55464
Reach-10A	1.1165	458.5	01Jan2012, 12:40	2.64274
Reach 11	1.5283	781.9	01Jan2012, 12:34	2.50758
Reach-12	1.5702	778.4	01Jan2012, 12:42	2.51653
Reach-13	1.6017	782.5	01Jan2012, 12:44	2.51377
Reach-14	1.6461	790.4	01Jan2012, 12:48	2.51647
Reach-15	0.1477	180.6	01Jan2012, 12:28	2.31499

Project: AlspaughBranch Simulation Run: PROP 005YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh PROP - 005Y
End of Run: 02Jan2012, 00:02 Meteorologic Model: 20% ACE
Compute Time: 03Apr2014, 14:14:10 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
A-14	0.0438	137.6	01Jan2012, 12:02	4.55985
A-15	0.0350	117.7	01Jan2012, 12:02	4.76989
A-16	0.0261	80.7	01Jan2012, 12:02	4.52063
A-17	0.0259	86.7	01Jan2012, 12:00	4.30572
A-18A	0.0215	53.4	01Jan2012, 12:06	4.06215
A-18B	0.0412	75.6	01Jan2012, 12:14	3.75235
A-19A	0.1477	289.1	01Jan2012, 12:12	3.61025
A-19B	0.1022	196.0	01Jan2012, 12:10	3.29984
A-20	0.1619	269.5	01Jan2012, 12:16	3.41666
A-21	0.0419	140.8	01Jan2012, 12:00	4.38672
A-22	0.0315	100.9	01Jan2012, 12:00	3.74515
A-23	0.0444	117.9	01Jan2012, 12:06	4.17598
A-24	0.0177	46.0	01Jan2012, 12:02	3.35024
J-01	0.9230	618.5	01Jan2012, 12:26	3.90963
J-02	1.0018	659.5	01Jan2012, 12:28	3.96533
J-03	1.0279	670.8	01Jan2012, 12:30	3.97630
J-04	1.0538	672.3	01Jan2012, 12:34	3.98232
J-05	1.0753	686.5	01Jan2012, 12:30	3.98392
J-06	1.1165	731.4	01Jan2012, 12:30	3.97106
J-07	1.3664	1118.3	01Jan2012, 12:22	3.87706
J-08	1.5283	1305.5	01Jan2012, 12:26	3.81754
J-09	1.5702	1315.1	01Jan2012, 12:30	3.82535
J-10	1.6017	1308.5	01Jan2012, 12:38	3.81671
j-11	1.6461	1326.4	01Jan2012, 12:38	3.82429
J-12	1.6461	1319.5	01Jan2012, 12:42	3.81545
Junction-A	0.1477	289.1	01Jan2012, 12:12	3.61025

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-B	0.2499	403.3	01Jan2012, 12:22	3.46713
OUTFALL	1.6638	1324.3	01Jan2012, 12:42	3.81050
PondPack Discharge	0.9230	618.5	01Jan2012, 12:26	3.90963
Reach-06	0.9230	616.9	01Jan2012, 12:30	3.90661
Reach-07	1.0018	657.1	01Jan2012, 12:30	3.96212
Reach-08	1.0279	663.7	01Jan2012, 12:36	3.97417
Reach-09	1.0753	686.0	01Jan2012, 12:32	3.97944
Reach-10	1.3664	1107.4	01Jan2012, 12:30	3.86504
Reach-10A	1.1165	731.3	01Jan2012, 12:30	3.96881
Reach 11	1.5283	1297.6	01Jan2012, 12:30	3.80996
Reach-12	1.5702	1299.6	01Jan2012, 12:38	3.81815
Reach-13	1.6017	1306.4	01Jan2012, 12:38	3.81455
Reach-14	1.6461	1319.5	01Jan2012, 12:42	3.81545
Reach-15	0.1477	281.6	01Jan2012, 12:26	3.58290

Project: AlspaughBranch Simulation Run: PROP 010YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh PROP - 010Y
End of Run: 02Jan2012, 00:02 Meteorologic Model: 10% ACE
Compute Time: 03Apr2014, 14:14:16 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
PondPack Discharge	0.9230	813.1	01Jan2012, 12:24	4.84152
J-01	0.9230	813.1	01Jan2012, 12:24	4.84152
Reach-06	0.9230	810.2	01Jan2012, 12:26	4.83768
A-14	0.0438	166.8	01Jan2012, 12:02	5.51907
A-15	0.0350	141.8	01Jan2012, 12:02	5.73908
J-02	1.0018	870.0	01Jan2012, 12:24	4.89896
Reach-07	1.0018	843.3	01Jan2012, 12:34	4.89488
A-16	0.0261	98.0	01Jan2012, 12:02	5.47798
J-03	1.0279	858.4	01Jan2012, 12:32	4.90969
Reach-08	1.0279	833.9	01Jan2012, 12:42	4.90699
A-17	0.0259	105.9	01Jan2012, 12:00	5.25354
J-04	1.0538	842.7	01Jan2012, 12:42	4.91551
A-18A	0.0215	65.7	01Jan2012, 12:06	4.99732
J-05	1.0753	853.7	01Jan2012, 12:42	4.91714
Reach-09	1.0753	853.0	01Jan2012, 12:44	4.91145
A-18B	0.0412	94.3	01Jan2012, 12:14	4.67153
J-06	1.1165	887.4	01Jan2012, 12:42	4.90260
Reach-10A	1.1165	886.9	01Jan2012, 12:42	4.89973
A-19A	0.1477	362.4	01Jan2012, 12:10	4.52337
Junction-A	0.1477	362.4	01Jan2012, 12:10	4.52337
Reach-15	0.1477	353.8	01Jan2012, 12:24	4.49179
A-19B	0.1022	249.0	01Jan2012, 12:10	4.19866
Junction-B	0.2499	514.0	01Jan2012, 12:20	4.37191
J-07	1.3664	1370.0	01Jan2012, 12:20	4.80320
Reach-10	1.3664	1354.1	01Jan2012, 12:28	4.78794
A-20	0.1619	340.5	01Jan2012, 12:16	4.31988

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
J-08	1.5283	1630.1	01Jan2012, 12:24	4.73836
Reach 11	1.5283	1618.8	01Jan2012, 12:28	4.72873
A-21	0.0419	171.5	01Jan2012, 12:00	5.33830
J-09	1.5702	1641.7	01Jan2012, 12:28	4.74499
Reach-12	1.5702	1624.6	01Jan2012, 12:34	4.73580
A-22	0.0315	125.4	01Jan2012, 12:00	4.66701
J-10	1.6017	1636.7	01Jan2012, 12:34	4.73445
Reach-13	1.6017	1633.4	01Jan2012, 12:36	4.73168
A-23	0.0444	144.5	01Jan2012, 12:06	5.11673
j-11	1.6461	1659.8	01Jan2012, 12:36	4.74206
Reach-14	1.6461	1656.0	01Jan2012, 12:38	4.73073
J-12	1.6461	1656.0	01Jan2012, 12:38	4.73073
A-24	0.0177	58.3	01Jan2012, 12:02	4.23470
OUTFALL	1.6638	1662.6	01Jan2012, 12:38	4.72546

Project: AlspaughBranch Simulation Run: PROP 025YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh PROP - 025Y
End of Run: 02Jan2012, 00:02 Meteorologic Model: 04% ACE
Compute Time: 03Apr2014, 14:14:22 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
A-14	0.0438	199.0	01Jan2012, 12:02	6.58362
A-15	0.0350	168.3	01Jan2012, 12:02	6.81223
A-16	0.0261	117.0	01Jan2012, 12:02	6.54092
A-17	0.0259	127.0	01Jan2012, 12:00	6.30848
A-18A	0.0215	79.5	01Jan2012, 12:06	6.04102
A-18B	0.0412	115.0	01Jan2012, 12:14	5.70106
A-19A	0.1477	444.0	01Jan2012, 12:10	5.54790
A-19B	0.1022	307.8	01Jan2012, 12:10	5.21100
A-20	0.1619	419.5	01Jan2012, 12:14	5.33567
A-21	0.0419	205.4	01Jan2012, 12:00	6.39644
A-22	0.0315	152.4	01Jan2012, 12:00	5.69977
A-23	0.0444	174.0	01Jan2012, 12:06	6.16528
A-24	0.0177	71.9	01Jan2012, 12:02	5.23380
J-01	0.9230	1105.1	01Jan2012, 12:20	5.86735
J-02	1.0018	1178.4	01Jan2012, 12:22	5.92714
J-03	1.0279	1177.1	01Jan2012, 12:26	5.93767
J-04	1.0538	1178.2	01Jan2012, 12:30	5.94344
J-05	1.0753	1201.6	01Jan2012, 12:28	5.94539
J-06	1.1165	1264.6	01Jan2012, 12:30	5.92944
J-07	1.3664	1798.6	01Jan2012, 12:28	5.82760
J-08	1.5283	2014.2	01Jan2012, 12:32	5.75845
J-09	1.5702	2025.3	01Jan2012, 12:36	5.76381
J-10	1.6017	2028.0	01Jan2012, 12:40	5.75137
j-11	1.6461	2052.7	01Jan2012, 12:40	5.75918
J-12	1.6461	2048.8	01Jan2012, 12:44	5.74514
Junction-A	0.1477	444.0	01Jan2012, 12:10	5.54790

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-B	0.2499	640.8	01Jan2012, 12:20	5.38875
OUTFALL	1.6638	2055.6	01Jan2012, 12:44	5.73970
PondPack Discharge	0.9230	1105.1	01Jan2012, 12:20	5.86735
Reach-06	0.9230	1092.9	01Jan2012, 12:22	5.86243
Reach-07	1.0018	1153.2	01Jan2012, 12:26	5.92195
Reach-08	1.0279	1162.9	01Jan2012, 12:30	5.93424
Reach-09	1.0753	1196.3	01Jan2012, 12:32	5.93820
Reach-10	1.3664	1766.8	01Jan2012, 12:34	5.80854
Reach-10A	1.1165	1262.5	01Jan2012, 12:32	5.92583
Reach 11	1.5283	2005.1	01Jan2012, 12:36	5.74647
Reach-12	1.5702	2015.5	01Jan2012, 12:40	5.75240
Reach-13	1.6017	2026.0	01Jan2012, 12:40	5.74793
Reach-14	1.6461	2048.8	01Jan2012, 12:44	5.74514
Reach-15	0.1477	432.7	01Jan2012, 12:24	5.51174

Project: AlspaughBranch Simulation Run: PROP 050YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh PROP - 050Y
End of Run: 02Jan2012, 00:02 Meteorologic Model: 02% ACE
Compute Time: 03Apr2014, 14:14:26 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
A-14	0.0438	228.9	01Jan2012, 12:02	7.57696
A-15	0.0350	192.9	01Jan2012, 12:02	7.81198
A-16	0.0261	134.7	01Jan2012, 12:02	7.53306
A-17	0.0259	146.7	01Jan2012, 12:00	7.29481
A-18A	0.0215	92.2	01Jan2012, 12:06	7.01870
A-18B	0.0412	134.3	01Jan2012, 12:14	6.66787
A-19A	0.1477	519.9	01Jan2012, 12:10	6.51116
A-19B	0.1022	362.5	01Jan2012, 12:10	6.16529
A-20	0.1619	493.4	01Jan2012, 12:14	6.29223
A-21	0.0419	236.9	01Jan2012, 12:00	7.38514
A-22	0.0315	177.5	01Jan2012, 12:00	6.66974
A-23	0.0444	201.4	01Jan2012, 12:06	7.14663
A-24	0.0177	84.7	01Jan2012, 12:02	6.17783
J-01	0.9230	1428.2	01Jan2012, 12:18	6.82843
J-02	1.0018	1521.9	01Jan2012, 12:20	6.89025
J-03	1.0279	1540.0	01Jan2012, 12:24	6.90068
J-04	1.0538	1555.5	01Jan2012, 12:26	6.90648
J-05	1.0753	1587.9	01Jan2012, 12:26	6.90872
J-06	1.1165	1674.4	01Jan2012, 12:26	6.89175
J-07	1.3664	2343.0	01Jan2012, 12:26	6.78851
J-08	1.5283	2614.4	01Jan2012, 12:30	6.71605
J-09	1.5702	2618.2	01Jan2012, 12:34	6.72031
J-10	1.6017	2599.9	01Jan2012, 12:40	6.70629
j-11	1.6461	2624.6	01Jan2012, 12:40	6.71427
J-12	1.6461	2618.5	01Jan2012, 12:44	6.69799
Junction-A	0.1477	519.9	01Jan2012, 12:10	6.51116

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-B	0.2499	757.7	01Jan2012, 12:20	6.34610
OUTFALL	1.6638	2626.4	01Jan2012, 12:44	6.69245
PondPack Discharge	0.9230	1428.2	01Jan2012, 12:18	6.82843
Reach-06	0.9230	1418.4	01Jan2012, 12:22	6.82271
Reach-07	1.0018	1509.4	01Jan2012, 12:24	6.88420
Reach-08	1.0279	1535.0	01Jan2012, 12:26	6.89669
Reach-09	1.0753	1583.3	01Jan2012, 12:28	6.90033
Reach-10	1.3664	2300.1	01Jan2012, 12:32	6.76627
Reach-10A	1.1165	1673.1	01Jan2012, 12:28	6.88753
Reach 11	1.5283	2593.4	01Jan2012, 12:34	6.70208
Reach-12	1.5702	2585.6	01Jan2012, 12:40	6.70702
Reach-13	1.6017	2593.9	01Jan2012, 12:40	6.70229
Reach-14	1.6461	2618.5	01Jan2012, 12:44	6.69799
Reach-15	0.1477	505.5	01Jan2012, 12:24	6.47122

Project: AlspaughBranch Simulation Run: PROP 100YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh PROP - 100Y
End of Run: 02Jan2012, 00:02 Meteorologic Model: 01% ACE
Compute Time: 03Apr2014, 14:14:29 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
A-14	0.0438	259.1	01Jan2012, 12:02	8.58444
A-15	0.0350	217.8	01Jan2012, 12:02	8.82482
A-16	0.0261	152.6	01Jan2012, 12:02	8.53953
A-17	0.0259	166.5	01Jan2012, 12:00	8.29659
A-18A	0.0215	105.1	01Jan2012, 12:06	8.01299
A-18B	0.0412	153.7	01Jan2012, 12:14	7.65279
A-19A	0.1477	596.6	01Jan2012, 12:10	7.49326
A-19B	0.1022	417.8	01Jan2012, 12:10	7.13999
A-20	0.1619	568.1	01Jan2012, 12:14	7.26858
A-21	0.0419	268.7	01Jan2012, 12:00	8.38887
A-22	0.0315	202.9	01Jan2012, 12:00	7.65798
A-23	0.0444	229.0	01Jan2012, 12:06	8.14403
A-24	0.0177	97.7	01Jan2012, 12:02	7.14382
J-01	0.9230	1880.3	01Jan2012, 12:22	7.79577
J-02	1.0018	1963.4	01Jan2012, 12:24	7.86020
J-03	1.0279	1987.7	01Jan2012, 12:26	7.87075
J-04	1.0538	2004.8	01Jan2012, 12:28	7.87680
J-05	1.0753	2039.5	01Jan2012, 12:26	7.87953
J-06	1.1165	2137.2	01Jan2012, 12:28	7.86203
J-07	1.3664	2890.9	01Jan2012, 12:26	7.75951
J-08	1.5283	3187.6	01Jan2012, 12:30	7.68519
J-09	1.5702	3189.8	01Jan2012, 12:36	7.68874
J-10	1.6017	3155.3	01Jan2012, 12:42	7.67355
j-11	1.6461	3182.4	01Jan2012, 12:42	7.68188
J-12	1.6461	3174.7	01Jan2012, 12:44	7.66359
Junction-A	0.1477	596.6	01Jan2012, 12:10	7.49326

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-B	0.2499	877.7	01Jan2012, 12:18	7.32271
OUTFALL	1.6638	3183.7	01Jan2012, 12:44	7.65806
PondPack Discharge	0.9230	1880.3	01Jan2012, 12:22	7.79577
Reach-06	0.9230	1864.8	01Jan2012, 12:24	7.78925
Reach-07	1.0018	1956.8	01Jan2012, 12:26	7.85332
Reach-08	1.0279	1983.4	01Jan2012, 12:28	7.86623
Reach-09	1.0753	2033.9	01Jan2012, 12:28	7.87005
Reach-10	1.3664	2837.2	01Jan2012, 12:32	7.73455
Reach-10A	1.1165	2131.9	01Jan2012, 12:30	7.85727
Reach 11	1.5283	3163.7	01Jan2012, 12:36	7.66955
Reach-12	1.5702	3139.6	01Jan2012, 12:42	7.67387
Reach-13	1.6017	3150.2	01Jan2012, 12:42	7.66907
Reach-14	1.6461	3174.7	01Jan2012, 12:44	7.66359
Reach-15	0.1477	581.4	01Jan2012, 12:22	7.44914

Project: AlspaughBranch Simulation Run: PROP 500YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh PROP - 500Y
End of Run: 02Jan2012, 00:02 Meteorologic Model: .2% ACE
Compute Time: 03Apr2014, 14:14:33 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
A-14	0.0438	330.8	01Jan2012, 12:02	10.99294
A-15	0.0350	276.8	01Jan2012, 12:02	11.24303
A-16	0.0261	195.0	01Jan2012, 12:02	10.94620
A-17	0.0259	213.6	01Jan2012, 12:00	10.69527
A-18A	0.0215	135.6	01Jan2012, 12:06	10.39730
A-18B	0.0412	199.9	01Jan2012, 12:14	10.01920
A-19A	0.1477	778.8	01Jan2012, 12:10	9.85509
A-19B	0.1022	549.0	01Jan2012, 12:10	9.48876
A-20	0.1619	745.5	01Jan2012, 12:14	9.61950
A-21	0.0419	344.2	01Jan2012, 12:00	10.79101
A-22	0.0315	262.9	01Jan2012, 12:00	10.03261
A-23	0.0444	294.7	01Jan2012, 12:06	10.53408
A-24	0.0177	128.6	01Jan2012, 12:02	9.47697
J-01	0.9230	3282.4	01Jan2012, 12:18	10.13963
J-02	1.0018	3394.9	01Jan2012, 12:20	10.20794
J-03	1.0279	3433.9	01Jan2012, 12:22	10.21824
J-04	1.0538	3463.6	01Jan2012, 12:24	10.22439
J-05	1.0753	3516.7	01Jan2012, 12:24	10.22785
J-06	1.1165	3656.3	01Jan2012, 12:24	10.20855
J-07	1.3664	4691.6	01Jan2012, 12:24	10.10583
J-08	1.5283	5130.4	01Jan2012, 12:28	10.02569
J-09	1.5702	5037.4	01Jan2012, 12:36	10.02648
J-10	1.6017	4925.3	01Jan2012, 12:42	10.00773
j-11	1.6461	4963.6	01Jan2012, 12:44	10.01628
J-12	1.6461	4953.1	01Jan2012, 12:46	9.99258
Junction-A	0.1477	778.8	01Jan2012, 12:10	9.85509

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-B	0.2499	1166.7	01Jan2012, 12:18	9.67399
OUTFALL	1.6638	4964.3	01Jan2012, 12:46	9.98710
PondPack Discharge	0.9230	3282.4	01Jan2012, 12:18	10.13963
Reach-06	0.9230	3250.7	01Jan2012, 12:22	10.13144
Reach-07	1.0018	3384.4	01Jan2012, 12:22	10.19928
Reach-08	1.0279	3431.4	01Jan2012, 12:24	10.21252
Reach-09	1.0753	3505.8	01Jan2012, 12:26	10.21581
Reach-10	1.3664	4619.8	01Jan2012, 12:30	10.07382
Reach-10A	1.1165	3653.5	01Jan2012, 12:26	10.20249
Reach 11	1.5283	5004.2	01Jan2012, 12:36	10.00551
Reach-12	1.5702	4905.2	01Jan2012, 12:42	10.00723
Reach-13	1.6017	4925.2	01Jan2012, 12:44	10.00193
Reach-14	1.6461	4953.1	01Jan2012, 12:46	9.99258
Reach-15	0.1477	759.0	01Jan2012, 12:22	9.80216

Project: AlspaughBranch Simulation Run: ULTPROP 100YR

Start of Run: 01Jan2012, 00:00 Basin Model: Alspaugh ULTPROP - 1
End of Run: 02Jan2012, 00:02 Meteorologic Model: 01% ACE
Compute Time: 03Apr2014, 14:14:44 Control Specifications: 1-day_2minutes

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
A-14	0.0438	259.1	01Jan2012, 12:02	8.58444
A-15	0.0350	217.8	01Jan2012, 12:02	8.82482
A-16	0.0261	152.6	01Jan2012, 12:02	8.53953
A-17	0.0259	166.5	01Jan2012, 12:00	8.29659
A-18A	0.0215	105.1	01Jan2012, 12:06	8.01299
A-18B	0.0412	153.7	01Jan2012, 12:14	7.65279
A-19A	0.1477	596.6	01Jan2012, 12:10	7.49326
A-19B	0.1022	417.8	01Jan2012, 12:10	7.13999
A-20	0.1619	568.1	01Jan2012, 12:14	7.26858
A-21	0.0419	268.7	01Jan2012, 12:00	8.38887
A-22	0.0315	202.9	01Jan2012, 12:00	7.65798
A-23	0.0444	229.0	01Jan2012, 12:06	8.14403
A-24	0.0177	97.7	01Jan2012, 12:02	7.14382
J-01	0.9230	1966.5	01Jan2012, 12:22	7.96417
J-02	1.0018	2051.7	01Jan2012, 12:24	8.01533
J-03	1.0279	2076.5	01Jan2012, 12:26	8.02193
J-04	1.0538	2100.7	01Jan2012, 12:26	8.02426
J-05	1.0753	2137.5	01Jan2012, 12:26	8.02404
J-06	1.1165	2234.6	01Jan2012, 12:28	8.00119
J-07	1.3664	2992.8	01Jan2012, 12:26	7.87321
J-08	1.5283	3300.2	01Jan2012, 12:30	7.78680
J-09	1.5702	3271.1	01Jan2012, 12:36	7.78761
J-10	1.6017	3241.4	01Jan2012, 12:42	7.77045
J-11	1.6461	3268.1	01Jan2012, 12:44	7.77615
J-12	1.6461	3263.3	01Jan2012, 12:46	7.75783
Junction-A	0.1477	596.6	01Jan2012, 12:10	7.49326

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-B	0.2499	877.7	01Jan2012, 12:18	7.32271
OUTFALL	1.6638	3271.9	01Jan2012, 12:46	7.75129
PondPack Discharge	0.9230	1966.5	01Jan2012, 12:22	7.96417
Reach-06	0.9230	1953.2	01Jan2012, 12:24	7.95763
Reach-07	1.0018	2045.6	01Jan2012, 12:26	8.00845
Reach-08	1.0279	2077.6	01Jan2012, 12:26	8.01740
Reach-09	1.0753	2131.3	01Jan2012, 12:28	8.01454
Reach-10	1.3664	2945.8	01Jan2012, 12:32	7.84820
Reach-10A	1.1165	2232.2	01Jan2012, 12:28	7.99643
Reach 11	1.5283	3245.1	01Jan2012, 12:36	7.77113
Reach-12	1.5702	3225.7	01Jan2012, 12:42	7.77271
Reach-13	1.6017	3238.1	01Jan2012, 12:44	7.76596
Reach-14	1.6461	3263.3	01Jan2012, 12:46	7.75783
Reach-15	0.1477	581.4	01Jan2012, 12:22	7.44914

Appendix C.2

PondPack V8i Results for Alspaugh Branch (Y#0948)

PondPack Results - Alspaugh Branch

			Peak Flow (ft^3/s)							
Label	Outflow Node	Area (acres)	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR	100-YR ULT
A-01	Lake Parks Pond	128.66	338.13	509.14	627.24	756.70	876.23	992.99	1280.60	1011.76
A-02	Lake Parks Pond	15.03	57.55	84.32	102.67	122.74	141.25	156.28	203.87	156.28
A-03	Lake Parks Pond	13.19	54.12	78.70	95.53	113.93	130.89	143.47	188.33	143.47
A-04	Lake Parks Pond	32.88	98.62	146.73	179.82	216.05	249.48	281.03	362.56	317.11
A-05	Lake Parks Pond	20.09	75.08	110.22	134.32	160.68	184.99	205.56	267.23	205.56
A-06	Lake Parks Pond	26.93	94.39	137.48	166.99	199.27	229.03	255.80	329.79	269.01
A-07	Lake Parks Pond	25.85	109.75	161.13	196.35	234.87	270.38	290.23	390.54	290.23
A-08	Lake Parks Pond	63.76	230.72	330.26	398.34	472.78	541.48	605.92	774.31	605.92
A-09	Route 20 (Exit)	58.83	149.30	222.64	273.13	328.43	379.47	427.39	552.12	451.95
A-10	Route 20 (Exit)	90.25	238.05	354.30	434.28	521.86	602.68	680.65	876.08	686.99
A-11	Lakewood Pond	36.85	126.53	181.04	218.32	259.10	296.72	331.59	424.25	331.59
A-12	Lakewood Pond	67.35	113.27	174.87	217.82	265.08	308.82	347.17	457.03	351.23
A-13	Lakewood Pond	10.76	44.03	62.41	74.97	88.72	101.42	112.23	144.48	112.23

Lake Parks Pond		
Storm Event	Max WSE (ft)	Peak Flow (ft^3/s)
2-YR	535.89	185.20
5-YR	537.17	189.98
10-YR	538.02	200.00
25-YR	538.81	258.84
50-YR	539.24	491.53
100-YR	539.47	794.49
500-YR	540.00	1724.55
100-YR ULT	539.50	838.96

Lakewood Pond		
Storm Event	Max WSE (ft)	Peak Flow (ft^3/s)
2-YR	527.22	400.82
5-YR	528.40	618.25
10-YR	528.99	813.40
25-YR	529.47	1105.58
50-YR	529.75	1429.21
100-YR	530.14	1881.50
500-YR	531.17	3282.99
100-YR ULT	530.22	1967.32

Appendix C.3

HEC-RAS 4.1.0 Results for Alspaugh Creek (Y#0948)

AECOM

HEC-RAS Plan: ALSPAUGH-EXIST River: ALSPAUGH Reach: ALSPAUGH

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	11471	EX-2YR	400.00	521.61	526.35	523.99	526.46	0.000651	2.63	152.44	51.84	0.26
ALSPAUGH	11471	EX-5YR	620.00	521.61	527.01	524.61	527.18	0.000815	3.32	194.11	79.16	0.30
ALSPAUGH	11471	EX-10YR	815.00	521.61	527.49	525.08	527.70	0.000891	3.77	237.36	96.34	0.33
ALSPAUGH	11471	EX-25YR	1110.00	521.61	528.07	525.66	528.35	0.000986	4.33	307.53	187.96	0.35
ALSPAUGH	11471	EX-50YR	1430.00	521.61	528.68	526.22	528.95	0.000925	4.54	447.46	321.83	0.35
ALSPAUGH	11471	EX-100YR	1880.00	521.61	529.54	526.98	529.72	0.000596	4.03	847.64	506.33	0.28
ALSPAUGH	11471	EX-500YR	3280.00	521.61	530.89	528.74	531.03	0.000466	4.05	1682.86	705.09	0.26
ALSPAUGH	11471	ULT-100YR	1970.00	521.61	529.64	527.16	529.81	0.000585	4.03	898.18	522.90	0.28
ALSPAUGH	11354	EX-2YR	400.00	519.76	526.09	524.07	526.33	0.001856	4.12	118.39	68.49	0.37
ALSPAUGH	11354	EX-5YR	620.00	519.76	526.74	525.44	527.03	0.002045	4.78	166.45	80.38	0.40
ALSPAUGH	11354	EX-10YR	815.00	519.76	527.23	526.16	527.55	0.002068	5.15	210.25	93.62	0.40
ALSPAUGH	11354	EX-25YR	1110.00	519.76	527.84	526.66	528.19	0.002061	5.55	270.82	105.08	0.41
ALSPAUGH	11354	EX-50YR	1430.00	519.76	528.43	527.16	528.80	0.002018	5.87	336.29	118.26	0.41
ALSPAUGH	11354	EX-100YR	1880.00	519.76	529.18	527.65	529.58	0.002098	6.45	452.03	209.37	0.43
ALSPAUGH	11354	EX-500YR	3280.00	519.76	530.55	528.80	530.92	0.001854	6.84	875.39	463.45	0.42
ALSPAUGH	11354	ULT-100YR	1970.00	519.76	529.27	527.73	529.68	0.002090	6.50	472.96	225.38	0.43
ALSPAUGH	11050	EX-2YR	400.00	519.77	524.35	524.35	525.18	0.009630	7.47	59.96	44.74	0.80
ALSPAUGH	11050	EX-5YR	620.00	519.77	525.04	525.04	525.88	0.008017	7.94	96.47	56.50	0.76
ALSPAUGH	11050	EX-10YR	815.00	519.77	525.38	525.38	526.36	0.008606	8.77	116.15	58.84	0.80
ALSPAUGH	11050	EX-25YR	1110.00	519.77	525.87	525.87	526.99	0.008715	9.58	145.72	62.43	0.82
ALSPAUGH	11050	EX-50YR	1430.00	519.77	526.30	526.30	527.58	0.009056	10.41	172.98	65.63	0.85
ALSPAUGH	11050	EX-100YR	1880.00	519.77	526.87	526.87	528.33	0.009016	11.23	212.32	71.23	0.87
ALSPAUGH	11050	EX-500YR	3280.00	519.77	528.63	528.63	529.88	0.006564	11.62	438.93	175.54	0.78
ALSPAUGH	11050	ULT-100YR	1970.00	519.77	527.06	527.06	528.46	0.008336	11.06	226.36	78.27	0.84
ALSPAUGH	10836	EX-2YR	400.00	516.43	523.27		523.37	0.000916	3.04	163.57	64.22	0.24
ALSPAUGH	10836	EX-5YR	620.00	516.43	523.81		523.98	0.001274	3.85	200.76	72.23	0.29
ALSPAUGH	10836	EX-10YR	815.00	516.43	524.47		524.65	0.001250	4.12	251.96	84.27	0.30
ALSPAUGH	10836	EX-25YR	1110.00	516.43	525.27		525.47	0.001249	4.48	326.04	101.40	0.30
ALSPAUGH	10836	EX-50YR	1430.00	516.43	525.96		526.19	0.001474	5.18	416.30	144.95	0.33
ALSPAUGH	10836	EX-100YR	1880.00	516.43	526.61		526.86	0.001397	5.33	511.41	149.38	0.33
ALSPAUGH	10836	EX-500YR	3280.00	516.43	528.13		528.46	0.001391	5.96	746.04	162.09	0.34
ALSPAUGH	10836	ULT-100YR	1970.00	516.43	526.72		526.97	0.001398	5.38	527.78	150.12	0.33
ALSPAUGH	10679	EX-2YR	425.00	518.73	522.75		523.07	0.005041	5.15	110.13	91.30	0.53
ALSPAUGH	10679	EX-5YR	660.00	518.73	523.34		523.64	0.004035	5.21	167.00	100.08	0.49
ALSPAUGH	10679	EX-10YR	870.00	518.73	524.21		524.41	0.002060	4.31	259.51	115.61	0.36
ALSPAUGH	10679	EX-25YR	1180.00	518.73	525.08		525.26	0.001417	4.04	369.12	131.25	0.31
ALSPAUGH	10679	EX-50YR	1520.00	518.73	525.79		525.98	0.001254	4.13	465.71	142.86	0.30

HEC-RAS Plan: ALSPAUGH-EXIST River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	10679	EX-100YR	1960.00	518.73	526.42		526.64	0.001335	4.56	565.58	173.28	0.31
ALSPAUGH	10679	EX-500YR	3400.00	518.73	527.97		528.22	0.001377	5.33	898.53	236.82	0.33
ALSPAUGH	10679	ULT-100YR	2050.00	518.73	526.53		526.75	0.001343	4.63	584.75	184.64	0.32
ALSPAUGH	10336	EX-2YR	425.00	516.89	521.52		521.75	0.003070	4.61	122.15	65.94	0.42
ALSPAUGH	10336	EX-5YR	660.00	516.89	522.17		522.45	0.003154	5.21	168.33	75.49	0.44
ALSPAUGH	10336	EX-10YR	870.00	516.89	523.76		523.90	0.001110	3.81	307.50	100.36	0.28
ALSPAUGH	10336	EX-25YR	1180.00	516.89	524.74		524.88	0.000912	3.82	411.18	111.26	0.26
ALSPAUGH	10336	EX-50YR	1520.00	516.89	525.45		525.62	0.000921	4.10	493.62	120.57	0.26
ALSPAUGH	10336	EX-100YR	1960.00	516.89	526.03		526.23	0.001118	4.74	568.65	137.48	0.29
ALSPAUGH	10336	EX-500YR	3400.00	516.89	527.33		527.70	0.001782	6.61	792.49	211.78	0.38
ALSPAUGH	10336	ULT-100YR	2050.00	516.89	526.13		526.34	0.001147	4.85	582.47	139.08	0.30
ALSPAUGH	10027	EX-2YR	425.00	515.82	520.06	519.71	520.48	0.005780	6.19	93.60	55.06	0.58
ALSPAUGH	10027	EX-5YR	660.00	515.82	521.17		521.48	0.003248	5.55	161.32	67.65	0.45
ALSPAUGH	10027	EX-10YR	870.00	515.82	523.53		523.63	0.000673	3.31	358.38	99.55	0.22
ALSPAUGH	10027	EX-25YR	1180.00	515.82	524.54		524.65	0.000617	3.47	465.43	113.18	0.22
ALSPAUGH	10027	EX-50YR	1520.00	515.82	525.24		525.37	0.000660	3.79	548.55	122.71	0.23
ALSPAUGH	10027	EX-100YR	1960.00	515.82	525.77		525.94	0.000810	4.37	614.77	129.81	0.25
ALSPAUGH	10027	EX-500YR	3400.00	515.82	526.78		527.15	0.001845	7.06	771.19	194.73	0.39
ALSPAUGH	10027	ULT-100YR	2050.00	515.82	525.86		526.04	0.000843	4.48	626.51	131.03	0.26
ALSPAUGH	9945	EX-2YR	265.00	516.09	519.27	519.27	519.87	0.012693	6.59	48.13	44.35	0.80
ALSPAUGH	9945	EX-5YR	660.00	516.09	520.76		521.16	0.005280	6.06	143.34	77.45	0.56
ALSPAUGH	9945	EX-10YR	870.00	516.09	523.50		523.58	0.000530	2.80	401.47	113.28	0.20
ALSPAUGH	9945	EX-25YR	1180.00	516.09	524.51		524.60	0.000485	2.95	525.21	131.43	0.19
ALSPAUGH	9945	EX-50YR	1550.00	516.09	525.22		525.32	0.000525	3.27	620.80	140.26	0.20
ALSPAUGH	9945	EX-100YR	1990.00	516.09	525.74		525.87	0.000649	3.79	696.91	151.35	0.23
ALSPAUGH	9945	EX-500YR	3450.00	516.09	526.75		527.01	0.001119	5.36	879.80	238.51	0.30
ALSPAUGH	9945	ULT-100YR	2080.00	516.09	525.83		525.97	0.000671	3.88	710.57	152.65	0.23
ALSPAUGH	9627	EX-2YR	265.00	512.87	517.82	515.75	517.95	0.001643	3.00	97.23	56.12	0.30
ALSPAUGH	9627	EX-5YR	660.00	512.87	520.75	517.62	520.80	0.000335	2.10	413.13	151.54	0.15
ALSPAUGH	9627	EX-10YR	870.00	512.87	523.49	518.31	523.51	0.000080	1.32	826.86	199.56	0.08
ALSPAUGH	9627	EX-25YR	1180.00	512.87	524.51	518.81	524.53	0.000075	1.38	1131.06	215.19	0.08
ALSPAUGH	9627	EX-50YR	1550.00	512.87	525.22	519.27	525.24	0.000096	1.64	1291.96	243.41	0.09
ALSPAUGH	9627	EX-100YR	1990.00	512.87	525.74	519.74	525.77	0.000126	1.94	1431.40	311.24	0.10
ALSPAUGH	9627	EX-500YR	3450.00	512.87	526.75	520.71	526.82	0.000241	2.84	1787.96	416.87	0.14
ALSPAUGH	9627	ULT-100YR	2080.00	512.87	525.82	519.81	525.86	0.000141	2.06	1458.38	318.74	0.11
ALSPAUGH	9548	EX-2YR	315.00	512.14	517.74	515.05	517.85	0.000911	2.69	117.08	39.68	0.24

HEC-RAS Plan: ALSPAUGH-EXIST River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	9548	EX-5YR	665.00	512.14	520.56	516.27	520.72	0.000659	3.29	202.06	59.39	0.22
ALSPAUGH	9548	EX-10YR	860.00	512.14	523.32	516.79	523.47	0.000348	3.01	285.55	103.58	0.17
ALSPAUGH	9548	EX-25YR	1170.00	512.14	524.42	517.45	524.50	0.000234	2.66	609.38	159.76	0.14
ALSPAUGH	9548	EX-50YR	1560.00	512.14	525.09	518.21	525.20	0.000303	3.15	727.67	212.98	0.17
ALSPAUGH	9548	EX-100YR	2010.00	512.14	525.56	519.03	525.72	0.000410	3.77	839.34	262.68	0.19
ALSPAUGH	9548	EX-500YR	3470.00	512.14	526.46	521.30	526.73	0.000705	5.19	1132.91	383.73	0.26
ALSPAUGH	9548	ULT-100YR	2100.00	512.14	525.64	519.17	525.81	0.000425	3.85	861.14	268.96	0.20
ALSPAUGH	9506		Culvert									
ALSPAUGH	9451	EX-2YR	315.00	511.28	517.00	514.38	517.18	0.001627	3.52	105.64	36.85	0.28
ALSPAUGH	9451	EX-5YR	665.00	511.28	517.70	516.05	518.21	0.004196	6.17	137.48	61.98	0.46
ALSPAUGH	9451	EX-10YR	860.00	511.28	518.17	516.73	518.78	0.004702	6.89	162.19	71.39	0.49
ALSPAUGH	9451	EX-25YR	1170.00	511.28	518.87	517.87	519.54	0.004896	7.57	224.95	83.18	0.51
ALSPAUGH	9451	EX-50YR	1560.00	511.28	519.73	518.75	520.38	0.004389	7.76	301.75	94.20	0.50
ALSPAUGH	9451	EX-100YR	2010.00	511.28	520.50	519.33	521.17	0.004301	8.19	377.51	106.51	0.50
ALSPAUGH	9451	EX-500YR	3470.00	511.28	522.33	520.79	523.12	0.004460	9.51	609.98	158.25	0.52
ALSPAUGH	9451	ULT-100YR	2100.00	511.28	520.63	519.41	521.31	0.004311	8.28	391.84	109.30	0.50
ALSPAUGH	9410	EX-2YR	350.00	512.15	516.11	515.92	516.85	0.014264	7.01	55.81	45.05	0.77
ALSPAUGH	9410	EX-5YR	675.00	512.15	517.41	517.04	517.96	0.007634	6.74	133.30	71.78	0.60
ALSPAUGH	9410	EX-10YR	875.00	512.15	517.97	517.42	518.51	0.006572	6.84	171.57	81.14	0.57
ALSPAUGH	9410	EX-25YR	1190.00	512.15	518.74	517.86	519.24	0.005315	6.85	246.26	92.65	0.53
ALSPAUGH	9410	EX-50YR	1590.00	512.15	519.64	518.44	520.10	0.004248	6.81	337.25	106.67	0.49
ALSPAUGH	9410	EX-100YR	2040.00	512.15	520.42	518.88	520.90	0.003892	7.06	425.49	118.96	0.47
ALSPAUGH	9410	EX-500YR	3520.00	512.15	522.28	520.09	522.82	0.003594	7.96	691.32	163.91	0.47
ALSPAUGH	9410	ULT-100YR	2130.00	512.15	520.56	518.93	521.04	0.003859	7.13	441.74	121.22	0.47
ALSPAUGH	9126	EX-2YR	350.00	508.98	515.22		515.39	0.002202	3.54	114.24	44.19	0.31
ALSPAUGH	9126	EX-5YR	675.00	508.98	516.34		516.64	0.002893	4.80	167.82	51.60	0.38
ALSPAUGH	9126	EX-10YR	875.00	508.98	516.78		517.17	0.003411	5.51	191.45	54.55	0.41
ALSPAUGH	9126	EX-25YR	1190.00	508.98	517.41		517.94	0.004102	6.49	226.92	60.82	0.46
ALSPAUGH	9126	EX-50YR	1590.00	508.98	518.12		518.82	0.004845	7.59	276.09	76.57	0.51
ALSPAUGH	9126	EX-100YR	2040.00	508.98	518.77		519.60	0.005366	8.48	329.83	89.37	0.55
ALSPAUGH	9126	EX-500YR	3520.00	508.98	520.48		521.53	0.005789	10.11	525.40	132.06	0.59
ALSPAUGH	9126	ULT-100YR	2130.00	508.98	518.88		519.74	0.005450	8.63	339.92	91.13	0.55
ALSPAUGH	8731	EX-2YR	385.00	508.07	514.40		514.57	0.002113	3.55	141.45	86.56	0.31
ALSPAUGH	8731	EX-5YR	725.00	508.07	515.52		515.72	0.002024	4.10	247.90	102.76	0.32
ALSPAUGH	8731	EX-10YR	915.00	508.07	515.91		516.13	0.002178	4.46	288.38	106.25	0.33
ALSPAUGH	8731	EX-25YR	1250.00	508.07	516.39		516.68	0.002618	5.17	340.89	111.55	0.37

HEC-RAS Plan: ALSPAUGH-EXIST River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	8731	EX-50YR	1680.00	508.07	517.13		517.44	0.002612	5.58	425.67	119.74	0.38
ALSPAUGH	8731	EX-100YR	2140.00	508.07	517.75		518.11	0.002752	6.07	502.96	129.10	0.39
ALSPAUGH	8731	EX-500YR	3670.00	508.07	519.51		519.97	0.002810	7.08	757.09	157.17	0.41
ALSPAUGH	8731	ULT-100YR	2230.00	508.07	517.85		518.22	0.002798	6.18	515.96	130.70	0.40
ALSPAUGH	8436	EX-2YR	555.00	507.53	513.62		513.85	0.002696	4.32	186.54	111.74	0.35
ALSPAUGH	8436	EX-5YR	1115.00	507.53	514.56		514.89	0.003581	5.63	302.81	134.44	0.42
ALSPAUGH	8436	EX-10YR	1370.00	507.53	514.90		515.26	0.003751	5.99	349.53	139.60	0.43
ALSPAUGH	8436	EX-25YR	1720.00	507.53	515.34		515.73	0.003891	6.40	411.70	147.93	0.45
ALSPAUGH	8436	EX-50YR	2340.00	507.53	516.11		516.52	0.003722	6.75	532.03	164.11	0.45
ALSPAUGH	8436	EX-100YR	2890.00	507.53	516.78		517.20	0.003535	6.99	648.01	186.10	0.44
ALSPAUGH	8436	EX-500YR	4700.00	507.53	518.80		519.18	0.002562	6.93	1074.07	239.49	0.39
ALSPAUGH	8436	ULT-100YR	2990.00	507.53	516.90		517.32	0.003444	6.97	671.22	188.32	0.44
ALSPAUGH	8211	EX-2YR	555.00	507.73	513.00	512.49	513.22	0.004523	4.65	175.76	113.60	0.44
ALSPAUGH	8211	EX-5YR	1115.00	507.73	513.84		514.17	0.005405	5.88	281.55	137.90	0.50
ALSPAUGH	8211	EX-10YR	1370.00	507.73	514.22		514.56	0.005041	6.02	336.16	149.23	0.49
ALSPAUGH	8211	EX-25YR	1720.00	507.73	514.71		515.05	0.004589	6.14	410.87	154.94	0.48
ALSPAUGH	8211	EX-50YR	2340.00	507.73	515.58		515.92	0.003880	6.27	554.14	178.11	0.45
ALSPAUGH	8211	EX-100YR	2890.00	507.73	516.37		516.68	0.003018	6.00	698.13	187.69	0.41
ALSPAUGH	8211	EX-500YR	4700.00	507.73	518.54		518.84	0.002008	5.89	1148.66	225.08	0.35
ALSPAUGH	8211	ULT-100YR	2990.00	507.73	516.51		516.82	0.002890	5.96	725.02	189.20	0.40
ALSPAUGH	7986	EX-2YR	555.00	507.75	511.62		512.04	0.006333	5.72	136.66	111.92	0.60
ALSPAUGH	7986	EX-5YR	1115.00	507.75	512.96		513.26	0.003423	5.46	316.36	149.68	0.47
ALSPAUGH	7986	EX-10YR	1370.00	507.75	513.47		513.76	0.002913	5.44	396.33	164.36	0.44
ALSPAUGH	7986	EX-25YR	1720.00	507.75	514.10		514.36	0.002408	5.37	501.70	174.08	0.41
ALSPAUGH	7986	EX-50YR	2340.00	507.75	515.10		515.35	0.001936	5.41	687.79	197.94	0.38
ALSPAUGH	7986	EX-100YR	2890.00	507.75	515.99		516.23	0.001580	5.34	877.85	223.81	0.35
ALSPAUGH	7986	EX-500YR	4700.00	507.75	518.31		518.52	0.001078	5.31	1451.86	273.49	0.30
ALSPAUGH	7986	ULT-100YR	2990.00	507.75	516.16		516.38	0.001500	5.28	914.95	225.33	0.34
ALSPAUGH	7797	EX-2YR	555.00	508.19	511.57		511.61	0.000731	2.00	366.13	183.09	0.21
ALSPAUGH	7797	EX-5YR	1115.00	508.19	512.91		512.96	0.000576	2.29	616.91	194.09	0.20
ALSPAUGH	7797	EX-10YR	1370.00	508.19	513.42		513.48	0.000545	2.41	717.11	198.71	0.20
ALSPAUGH	7797	EX-25YR	1720.00	508.19	514.04		514.11	0.000524	2.56	841.94	204.72	0.20
ALSPAUGH	7797	EX-50YR	2340.00	508.19	515.04		515.13	0.000487	2.77	1052.03	211.72	0.19
ALSPAUGH	7797	EX-100YR	2890.00	508.19	515.94		516.03	0.000444	2.89	1243.99	218.06	0.19
ALSPAUGH	7797	EX-500YR	4700.00	508.19	518.25		518.37	0.000405	3.33	1771.86	235.88	0.19
ALSPAUGH	7797	ULT-100YR	2990.00	508.19	516.10		516.19	0.000436	2.91	1280.02	219.33	0.19

HEC-RAS Plan: ALSPAUGH-EXIST River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	7611	EX-2YR	555.00	507.93	511.12		511.36	0.003824	3.97	140.54	64.43	0.46
ALSPAUGH	7611	EX-5YR	1115.00	507.93	512.34		512.74	0.003584	5.10	224.03	71.84	0.48
ALSPAUGH	7611	EX-10YR	1370.00	507.93	512.80		513.26	0.003514	5.49	257.77	74.31	0.48
ALSPAUGH	7611	EX-25YR	1720.00	507.93	513.35		513.88	0.003520	5.98	299.01	77.21	0.50
ALSPAUGH	7611	EX-50YR	2340.00	507.93	514.25		514.91	0.003396	6.64	371.74	83.39	0.50
ALSPAUGH	7611	EX-100YR	2890.00	507.93	515.13		515.82	0.002994	6.88	446.68	87.56	0.48
ALSPAUGH	7611	EX-500YR	4700.00	507.93	517.27		518.16	0.002676	7.91	646.01	99.10	0.48
ALSPAUGH	7611	ULT-100YR	2990.00	507.93	515.29		515.99	0.002913	6.91	461.22	88.35	0.48
ALSPAUGH	7436	EX-2YR	555.00	506.14	509.36	509.22	510.09	0.016480	6.90	80.42	44.86	0.91
ALSPAUGH	7436	EX-5YR	1115.00	506.14	510.41	510.27	511.54	0.014688	8.56	130.94	51.52	0.92
ALSPAUGH	7436	EX-10YR	1370.00	506.14	510.83	510.65	512.10	0.013568	9.06	153.32	54.62	0.90
ALSPAUGH	7436	EX-25YR	1720.00	506.14	511.51	511.18	512.81	0.010823	9.22	191.71	58.43	0.83
ALSPAUGH	7436	EX-50YR	2340.00	506.14	512.86		514.04	0.006738	8.91	277.29	67.15	0.69
ALSPAUGH	7436	EX-100YR	2890.00	506.14	514.06		515.13	0.004728	8.58	361.61	73.26	0.60
ALSPAUGH	7436	EX-500YR	4700.00	506.14	516.23		517.54	0.004107	9.72	539.26	90.56	0.59
ALSPAUGH	7436	ULT-100YR	2990.00	506.14	514.27		515.33	0.004514	8.56	376.57	75.00	0.59
ALSPAUGH	7159	EX-2YR	555.00	503.00	507.16		507.59	0.005392	5.38	106.15	42.04	0.56
ALSPAUGH	7159	EX-5YR	1115.00	503.00	509.00		509.52	0.003808	5.96	197.13	56.02	0.51
ALSPAUGH	7159	EX-10YR	1370.00	503.00	509.77		510.30	0.003150	6.05	242.30	61.23	0.47
ALSPAUGH	7159	EX-25YR	1720.00	503.00	510.80		511.33	0.002484	6.08	309.26	68.34	0.43
ALSPAUGH	7159	EX-50YR	2340.00	503.00	512.46		512.97	0.001835	6.13	433.72	82.04	0.39
ALSPAUGH	7159	EX-100YR	2890.00	503.00	513.80		514.30	0.001476	6.11	551.27	93.15	0.36
ALSPAUGH	7159	EX-500YR	4700.00	503.00	516.03		516.69	0.001565	7.28	777.37	109.82	0.38
ALSPAUGH	7159	ULT-100YR	2990.00	503.00	514.02		514.51	0.001433	6.12	571.93	94.97	0.35
ALSPAUGH	7012	EX-2YR	555.00	502.98	506.54	505.82	506.99	0.003239	5.53	106.20	71.02	0.59
ALSPAUGH	7012	EX-5YR	1115.00	502.98	508.66	506.91	509.15	0.001738	5.86	203.19	85.75	0.47
ALSPAUGH	7012	EX-10YR	1370.00	502.98	509.46	507.35	509.99	0.001536	6.09	239.94	89.73	0.45
ALSPAUGH	7012	EX-25YR	1720.00	502.98	510.48	507.87	511.06	0.001354	6.38	286.96	96.67	0.43
ALSPAUGH	7012	EX-50YR	2340.00	502.98	512.06	508.67	512.74	0.001197	6.90	359.72	106.20	0.42
ALSPAUGH	7012	EX-100YR	2890.00	502.98	513.31	509.34	514.08	0.001121	7.33	417.32	113.64	0.42
ALSPAUGH	7012	EX-500YR	4700.00	502.98	516.14	511.26	516.48	0.000480	5.70	1117.24	137.02	0.29
ALSPAUGH	7012	ULT-100YR	2990.00	502.98	513.51	509.43	514.30	0.001117	7.41	426.56	115.13	0.42
ALSPAUGH	6989	EX-2YR	555.00	502.69	505.46	505.46	506.65	0.010672	8.75	63.79	28.03	1.00
ALSPAUGH	6989	EX-5YR	1115.00	502.69	506.88	506.88	508.69	0.008821	10.85	106.01	30.86	0.98
ALSPAUGH	6989	EX-10YR	1370.00	502.69	507.44	507.44	509.47	0.008344	11.56	123.34	31.52	0.97
ALSPAUGH	6989	EX-25YR	1720.00	502.69	508.10	508.10	510.47	0.008111	12.51	144.34	32.30	0.98
ALSPAUGH	6989	EX-50YR	2340.00	502.69	509.24	509.24	512.05	0.007394	13.70	182.50	34.41	0.97

HEC-RAS Plan: ALSPAUGH-EXIST River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	6989	EX-100YR	2890.00	502.69	510.13	510.13	513.31	0.007070	14.65	213.64	36.40	0.97
ALSPAUGH	6989	EX-500YR	4700.00	502.69	513.95	513.95	515.96	0.002978	12.69	537.79	137.81	0.68
ALSPAUGH	6989	ULT-100YR	2990.00	502.69	510.31	510.31	513.52	0.006915	14.73	220.47	38.06	0.97
ALSPAUGH	6963	EX-2YR	555.00	502.03	504.50	504.50	505.26	0.014628	7.29	80.33	92.13	0.98
ALSPAUGH	6963	EX-5YR	1115.00	502.03	505.40	505.40	506.60	0.012863	9.08	127.44	100.25	0.99
ALSPAUGH	6963	EX-10YR	1370.00	502.03	505.75	505.75	507.14	0.012538	9.74	145.40	102.66	1.00
ALSPAUGH	6963	EX-25YR	1720.00	502.03	506.20	506.20	507.82	0.011971	10.47	169.09	105.30	1.00
ALSPAUGH	6963	EX-50YR	2340.00	502.03	506.94	506.94	508.92	0.011259	11.56	207.27	111.38	1.00
ALSPAUGH	6963	EX-100YR	2890.00	502.03	507.55	507.55	509.83	0.010707	12.35	238.90	114.65	1.00
ALSPAUGH	6963	EX-500YR	4700.00	502.03	509.27	509.27	512.45	0.009815	14.53	328.42	123.00	1.01
ALSPAUGH	6963	ULT-100YR	2990.00	502.03	507.64	507.64	509.98	0.010686	12.51	243.98	115.04	1.00
ALSPAUGH	6569	EX-2YR	555.00	496.60	500.95		501.06	0.002455	3.73	227.76	144.90	0.37
ALSPAUGH	6569	EX-5YR	1115.00	496.60	501.69	500.72	501.88	0.003040	4.79	341.32	156.22	0.43
ALSPAUGH	6569	EX-10YR	1370.00	496.60	502.00	500.92	502.22	0.003091	5.08	390.25	161.11	0.44
ALSPAUGH	6569	EX-25YR	1720.00	496.60	502.35	501.19	502.60	0.003276	5.51	446.54	166.15	0.46
ALSPAUGH	6569	EX-50YR	2340.00	496.60	502.84	501.53	503.17	0.003659	6.25	530.99	174.97	0.49
ALSPAUGH	6569	EX-100YR	2890.00	496.60	503.08	501.83	503.51	0.004454	7.11	573.04	177.80	0.55
ALSPAUGH	6569	EX-500YR	4700.00	496.60	503.94	502.73	504.63	0.005746	8.94	730.90	188.45	0.64
ALSPAUGH	6569	ULT-100YR	2990.00	496.60	503.13	501.88	503.58	0.004549	7.23	582.23	178.38	0.55
ALSPAUGH	5732	EX-2YR	695.00	495.35	497.45	497.45	497.83	0.023138	7.06	157.68	181.08	0.96
ALSPAUGH	5732	EX-5YR	1265.00	495.35	497.81	497.81	498.38	0.025754	8.47	223.13	183.38	1.05
ALSPAUGH	5732	EX-10YR	1615.00	495.35	498.02	498.02	498.68	0.025315	8.96	261.60	184.80	1.05
ALSPAUGH	5732	EX-25YR	1980.00	495.35	498.20	498.20	498.97	0.026117	9.58	294.48	186.24	1.08
ALSPAUGH	5732	EX-50YR	2590.00	495.35	498.51	498.51	499.41	0.025093	10.18	353.30	189.53	1.08
ALSPAUGH	5732	EX-100YR	3180.00	495.35	499.06		499.85	0.016576	9.34	458.07	194.06	0.91
ALSPAUGH	5732	EX-500YR	5180.00	495.35	500.40		501.22	0.010266	9.24	725.72	204.65	0.76
ALSPAUGH	5732	ULT-100YR	3290.00	495.35	499.14		499.93	0.015930	9.31	473.88	194.67	0.89
ALSPAUGH	5148	EX-2YR	695.00	491.14	494.42		494.48	0.002134	2.31	361.28	220.48	0.29
ALSPAUGH	5148	EX-5YR	1265.00	491.14	496.93		496.96	0.000325	1.54	961.07	253.90	0.13
ALSPAUGH	5148	EX-10YR	1615.00	491.14	497.43		497.46	0.000360	1.74	1088.25	259.43	0.14
ALSPAUGH	5148	EX-25YR	1980.00	491.14	497.84		497.88	0.000402	1.94	1195.75	262.63	0.15
ALSPAUGH	5148	EX-50YR	2590.00	491.14	498.31		498.37	0.000502	2.30	1319.84	265.52	0.17
ALSPAUGH	5148	EX-100YR	3180.00	491.14	498.72		498.80	0.000592	2.61	1430.79	270.21	0.18
ALSPAUGH	5148	EX-500YR	5180.00	491.14	499.86		500.00	0.000853	3.51	1744.30	279.89	0.23
ALSPAUGH	5148	ULT-100YR	3290.00	491.14	498.78		498.86	0.000614	2.67	1446.75	270.98	0.19
ALSPAUGH	4570	EX-2YR	695.00	487.51	493.85		493.91	0.000933	2.64	408.67	178.22	0.21

HEC-RAS Plan: ALSPAUGH-EXIST River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	4570	EX-5YR	1265.00	487.51	496.82		496.85	0.000221	1.78	1015.13	224.83	0.11
ALSPAUGH	4570	EX-10YR	1615.00	487.51	497.30		497.33	0.000268	2.04	1124.37	231.33	0.13
ALSPAUGH	4570	EX-25YR	1980.00	487.51	497.69		497.74	0.000319	2.30	1215.61	235.00	0.14
ALSPAUGH	4570	EX-50YR	2590.00	487.51	498.11		498.18	0.000438	2.78	1316.33	244.09	0.16
ALSPAUGH	4570	EX-100YR	3180.00	487.51	498.48		498.57	0.000540	3.17	1407.74	247.57	0.18
ALSPAUGH	4570	EX-500YR	5180.00	487.51	499.47		499.64	0.000909	4.40	1661.00	266.45	0.24
ALSPAUGH	4570	ULT-100YR	3290.00	487.51	498.53		498.62	0.000564	3.25	1419.89	248.12	0.19
ALSPAUGH	4318	EX-2YR	695.00	487.30	493.84		493.85	0.000158	1.22	860.59	303.17	0.10
ALSPAUGH	4318	EX-5YR	1265.00	487.30	496.82		496.83	0.000051	0.97	1797.49	325.55	0.06
ALSPAUGH	4318	EX-10YR	1615.00	487.30	497.30		497.31	0.000064	1.13	1954.39	329.49	0.07
ALSPAUGH	4318	EX-25YR	1980.00	487.30	497.69		497.71	0.000079	1.30	2084.31	332.71	0.08
ALSPAUGH	4318	EX-50YR	2590.00	487.30	498.12		498.14	0.000110	1.58	2225.83	336.35	0.09
ALSPAUGH	4318	EX-100YR	3180.00	487.30	498.49		498.52	0.000140	1.84	2352.83	342.18	0.11
ALSPAUGH	4318	EX-500YR	5180.00	487.30	499.49		499.55	0.000244	2.59	2700.55	352.78	0.14
ALSPAUGH	4318	ULT-100YR	3290.00	487.30	498.54		498.57	0.000147	1.88	2369.82	342.67	0.11
ALSPAUGH	4252	EX-2YR	695.00	485.64	493.78	490.80	493.83	0.000332	2.29	416.09	396.26	0.15
ALSPAUGH	4252	EX-5YR	1265.00	485.64	496.82	491.63	496.83	0.000024	0.77	2537.00	480.60	0.04
ALSPAUGH	4252	EX-10YR	1615.00	485.64	497.30	492.09	497.31	0.000030	0.89	2769.07	487.25	0.05
ALSPAUGH	4252	EX-25YR	1980.00	485.64	497.70	492.40	497.70	0.000036	1.01	2961.61	492.84	0.05
ALSPAUGH	4252	EX-50YR	2590.00	485.64	498.12	492.87	498.13	0.000051	1.22	3171.71	497.76	0.06
ALSPAUGH	4252	EX-100YR	3180.00	485.64	498.50	493.27	498.51	0.000065	1.41	3359.82	503.62	0.07
ALSPAUGH	4252	EX-500YR	5180.00	485.64	499.50	494.43	499.53	0.000112	1.95	3874.19	515.54	0.10
ALSPAUGH	4252	ULT-100YR	3290.00	485.64	498.55	493.35	498.56	0.000068	1.45	3384.97	504.34	0.07
ALSPAUGH	4211	EX-2YR	680.00	486.90	493.61	489.95	493.78	0.000858	3.29	206.86	162.68	0.25
ALSPAUGH	4211	EX-5YR	1220.00	486.90	496.80	491.11	496.82	0.000104	1.54	1286.22	398.54	0.09
ALSPAUGH	4211	EX-10YR	1575.00	486.90	497.28	491.77	497.30	0.000119	1.71	1481.57	419.66	0.10
ALSPAUGH	4211	EX-25YR	2020.00	486.90	497.66	492.52	497.69	0.000146	1.95	1646.12	431.60	0.11
ALSPAUGH	4211	EX-50YR	2600.00	486.90	498.08	493.39	498.12	0.000181	2.24	1827.44	441.52	0.12
ALSPAUGH	4211	EX-100YR	3210.00	486.90	498.44	494.18	498.49	0.000218	2.51	1991.38	453.85	0.14
ALSPAUGH	4211	EX-500YR	5220.00	486.90	499.42	496.39	499.51	0.000327	3.27	2462.35	503.31	0.17
ALSPAUGH	4211	ULT-100YR	3310.00	486.90	498.49	494.32	498.55	0.000225	2.56	2013.32	455.14	0.14
ALSPAUGH	4185		Culvert									
ALSPAUGH	4161	EX-2YR	680.00	485.44	489.89	488.70	490.54	0.004096	6.48	104.97	50.79	0.58
ALSPAUGH	4161	EX-5YR	1220.00	485.44	490.35	489.99	492.03	0.009041	10.38	117.55	51.42	0.88
ALSPAUGH	4161	EX-10YR	1575.00	485.44	490.73	490.73	493.09	0.011415	12.33	127.76	51.93	1.00
ALSPAUGH	4161	EX-25YR	2020.00	485.44	490.86	490.86	492.71	0.010737	11.14	191.81	52.10	0.96

HEC-RAS Plan: ALSPAUGH-EXIST River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	4161	EX-50YR	2600.00	485.44	491.54	491.54	493.74	0.010516	12.18	227.64	53.01	0.97
ALSPAUGH	4161	EX-100YR	3210.00	485.44	492.22	492.22	494.73	0.010174	13.07	263.91	53.76	0.98
ALSPAUGH	4161	EX-500YR	5220.00	485.44	495.62	495.62	497.17	0.003935	11.16	731.52	298.55	0.66
ALSPAUGH	4161	ULT-100YR	3310.00	485.44	492.33	492.33	494.89	0.010126	13.20	269.65	53.88	0.98
ALSPAUGH	4105	EX-2YR	680.00	482.96	489.90	487.23	490.21	0.002087	4.73	168.33	139.16	0.35
ALSPAUGH	4105	EX-5YR	1220.00	482.96	490.61	489.08	491.17	0.003522	6.65	245.53	266.72	0.47
ALSPAUGH	4105	EX-10YR	1575.00	482.96	491.03	490.16	491.27	0.001989	5.22	525.84	308.45	0.35
ALSPAUGH	4105	EX-25YR	2020.00	482.96	491.35	490.69	491.61	0.002108	5.54	626.65	311.41	0.37
ALSPAUGH	4105	EX-50YR	2600.00	482.96	491.79	491.00	492.05	0.002073	5.72	763.56	321.34	0.37
ALSPAUGH	4105	EX-100YR	3210.00	482.96	492.15	491.24	492.43	0.002118	5.96	880.79	324.53	0.37
ALSPAUGH	4105	EX-500YR	5220.00	482.96	494.82	491.86	494.97	0.000685	4.12	1800.40	361.30	0.22
ALSPAUGH	4105	ULT-100YR	3310.00	482.96	492.25	491.28	492.52	0.002026	5.88	913.95	325.46	0.37
ALSPAUGH	3874	EX-2YR	680.00	482.95	489.00	488.23	489.50	0.005176	6.31	155.78	148.76	0.53
ALSPAUGH	3874	EX-5YR	1220.00	482.95	489.56	489.56	490.21	0.006788	7.84	248.26	176.74	0.63
ALSPAUGH	3874	EX-10YR	1575.00	482.95	489.78	489.78	490.54	0.007960	8.75	288.06	181.60	0.68
ALSPAUGH	3874	EX-25YR	2020.00	482.95	490.17	490.17	490.91	0.007515	8.93	362.57	195.27	0.67
ALSPAUGH	3874	EX-50YR	2600.00	482.95	490.39	490.39	491.31	0.009175	10.13	405.82	198.41	0.75
ALSPAUGH	3874	EX-100YR	3210.00	482.95	491.33		491.90	0.004774	8.09	609.22	239.69	0.55
ALSPAUGH	3874	EX-500YR	5220.00	482.95	494.64		494.84	0.000943	4.70	1545.86	320.88	0.26
ALSPAUGH	3874	ULT-100YR	3310.00	482.95	491.52		492.04	0.004197	7.72	655.94	248.77	0.52
ALSPAUGH	3726	EX-2YR	680.00	484.05	487.47	487.47	488.33	0.012948	7.66	96.79	65.33	0.85
ALSPAUGH	3726	EX-5YR	1220.00	484.05	488.46	488.46	489.07	0.007503	7.27	235.67	177.53	0.69
ALSPAUGH	3726	EX-10YR	1575.00	484.05	488.71	488.71	489.40	0.008076	7.90	280.71	182.98	0.72
ALSPAUGH	3726	EX-25YR	2020.00	484.05	488.98	488.98	489.76	0.008540	8.52	331.67	188.70	0.75
ALSPAUGH	3726	EX-50YR	2600.00	484.05	489.70		490.28	0.005304	7.49	475.88	207.01	0.61
ALSPAUGH	3726	EX-100YR	3210.00	484.05	491.14		491.44	0.001868	5.31	800.94	241.98	0.38
ALSPAUGH	3726	EX-500YR	5220.00	484.05	494.57		494.74	0.000550	3.86	1748.72	314.32	0.22
ALSPAUGH	3726	ULT-100YR	3310.00	484.05	491.36		491.64	0.001656	5.11	852.96	244.61	0.36
ALSPAUGH	3487	EX-2YR	680.00	483.07	484.41		484.61	0.006687	2.43	191.56	184.18	0.50
ALSPAUGH	3487	EX-5YR	1220.00	483.07	486.34		486.41	0.000655	1.77	568.44	204.22	0.19
ALSPAUGH	3487	EX-10YR	1575.00	483.07	487.38		487.44	0.000392	1.72	785.75	213.80	0.16
ALSPAUGH	3487	EX-25YR	2020.00	483.07	488.51		488.57	0.000275	1.73	1030.98	221.90	0.14
ALSPAUGH	3487	EX-50YR	2600.00	483.07	489.94		489.99	0.000195	1.74	1357.53	235.58	0.12
ALSPAUGH	3487	EX-100YR	3210.00	483.07	491.22		491.28	0.000159	1.78	1669.38	248.52	0.11
ALSPAUGH	3487	EX-500YR	5220.00	483.07	494.59		494.66	0.000119	1.97	2551.49	278.90	0.11
ALSPAUGH	3487	ULT-100YR	3310.00	483.07	491.43		491.49	0.000155	1.79	1720.30	250.69	0.11

HEC-RAS Plan: ALSPAUGH-EXIST River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	3234	EX-2YR	680.00	478.67	484.43	481.34	484.45	0.000141	1.29	588.22	257.84	0.10
ALSPAUGH	3234	EX-5YR	1220.00	478.67	486.31	481.82	486.34	0.000129	1.51	864.45	276.06	0.10
ALSPAUGH	3234	EX-10YR	1575.00	478.67	487.35	482.07	487.39	0.000126	1.64	1016.97	284.23	0.10
ALSPAUGH	3234	EX-25YR	2020.00	478.67	488.47	482.35	488.52	0.000126	1.78	1182.22	290.94	0.10
ALSPAUGH	3234	EX-50YR	2600.00	478.67	489.90	482.70	489.96	0.000121	1.93	1392.13	314.99	0.10
ALSPAUGH	3234	EX-100YR	3210.00	478.67	491.18	483.01	491.25	0.000121	2.08	1580.58	338.39	0.11
ALSPAUGH	3234	EX-500YR	5220.00	478.67	494.60	483.96	494.63	0.000044	1.49	4076.25	380.97	0.07
ALSPAUGH	3234	ULT-100YR	3310.00	478.67	491.39	483.06	491.45	0.000121	2.11	1610.35	341.86	0.11
ALSPAUGH	3141	EX-2YR	675.00	479.32	483.36		484.17	0.008316	7.25	95.53	33.27	0.71
ALSPAUGH	3141	EX-5YR	1215.00	479.32	484.01	484.01	485.78	0.014412	10.78	117.57	35.39	0.97
ALSPAUGH	3141	EX-10YR	1565.00	479.32	484.68	484.68	486.74	0.013636	11.68	142.08	37.12	0.97
ALSPAUGH	3141	EX-25YR	1990.00	479.32	485.45	485.45	487.79	0.012730	12.53	171.30	39.00	0.96
ALSPAUGH	3141	EX-50YR	2590.00	479.32	486.40	486.40	489.12	0.011999	13.58	209.70	41.39	0.96
ALSPAUGH	3141	EX-100YR	3180.00	479.32	487.24	487.24	490.31	0.011623	14.53	245.15	44.29	0.96
ALSPAUGH	3141	EX-500YR	5080.00	479.32	489.65	489.65	493.48	0.010176	16.52	362.80	52.83	0.95
ALSPAUGH	3141	ULT-100YR	3280.00	479.32	487.38	487.38	490.50	0.011494	14.65	251.72	44.97	0.96
ALSPAUGH	3040	EX-2YR	675.00	478.83	482.63	482.59	483.20	0.009174	6.85	133.61	118.13	0.73
ALSPAUGH	3040	EX-5YR	1215.00	478.83	483.82		484.26	0.004828	6.32	255.36	133.61	0.56
ALSPAUGH	3040	EX-10YR	1565.00	478.83	484.52		484.93	0.003714	6.18	330.49	140.64	0.50
ALSPAUGH	3040	EX-25YR	1990.00	478.83	485.29		485.69	0.002982	6.13	415.90	147.73	0.46
ALSPAUGH	3040	EX-50YR	2590.00	478.83	486.28		486.69	0.002413	6.16	528.33	153.79	0.43
ALSPAUGH	3040	EX-100YR	3180.00	478.83	487.14		487.56	0.002116	6.28	629.15	158.82	0.41
ALSPAUGH	3040	EX-500YR	5080.00	478.83	489.02		489.61	0.002464	7.90	910.05	173.54	0.46
ALSPAUGH	3040	ULT-100YR	3280.00	478.83	487.26		487.70	0.002089	6.31	644.44	159.58	0.41
ALSPAUGH	2587	EX-2YR	675.00	475.19	480.85		481.20	0.003058	5.25	150.91	44.70	0.44
ALSPAUGH	2587	EX-5YR	1215.00	475.19	482.03		482.64	0.003982	7.00	205.55	48.03	0.52
ALSPAUGH	2587	EX-10YR	1565.00	475.19	482.62		483.40	0.004498	7.94	234.33	49.69	0.56
ALSPAUGH	2587	EX-25YR	1990.00	475.19	483.23		484.22	0.005066	8.97	265.22	51.42	0.60
ALSPAUGH	2587	EX-50YR	2590.00	475.19	483.93		485.22	0.005889	10.31	301.93	53.40	0.66
ALSPAUGH	2587	EX-100YR	3180.00	475.19	484.64	483.18	486.14	0.006207	11.24	346.86	96.56	0.69
ALSPAUGH	2587	EX-500YR	5080.00	475.19	486.42	485.74	488.12	0.006109	12.69	536.88	113.85	0.70
ALSPAUGH	2587	ULT-100YR	3280.00	475.19	484.66	483.29	486.24	0.006541	11.55	348.61	98.05	0.71
ALSPAUGH	2454	EX-2YR	685.00	474.63	479.05	479.05	480.20	0.022606	8.63	80.11	36.73	0.99
ALSPAUGH	2454	EX-5YR	1225.00	474.63	480.31	480.31	481.58	0.015075	9.37	147.25	62.02	0.87
ALSPAUGH	2454	EX-10YR	1580.00	474.63	480.82	480.82	482.26	0.014695	10.10	179.87	64.49	0.88
ALSPAUGH	2454	EX-25YR	2010.00	474.63	481.37	481.37	482.99	0.014472	10.89	215.95	68.13	0.89
ALSPAUGH	2454	EX-50YR	2610.00	474.63	482.05	482.05	483.89	0.014143	11.78	263.96	73.40	0.90

HEC-RAS Plan: ALSPAUGH-EXIST River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	2454	EX-100YR	3200.00	474.63	482.47	482.47	484.69	0.015626	13.03	295.72	76.74	0.95
ALSPAUGH	2454	EX-500YR	5130.00	474.63	484.26	484.26	486.74	0.013069	14.26	456.33	103.12	0.91
ALSPAUGH	2454	ULT-100YR	3300.00	474.63	482.66	482.66	484.80	0.014533	12.84	310.52	78.02	0.93
ALSPAUGH	2260	EX-2YR	685.00	474.03	478.70	478.70	478.75	0.001400	2.37	396.23	228.12	0.25
ALSPAUGH	2260	EX-5YR	1225.00	474.03	478.88	478.70	479.01	0.003263	3.76	437.84	229.57	0.38
ALSPAUGH	2260	EX-10YR	1580.00	474.03	479.20	478.71	479.35	0.003351	4.07	510.30	233.41	0.39
ALSPAUGH	2260	EX-25YR	2010.00	474.03	479.54	478.71	479.73	0.003482	4.43	592.44	247.26	0.41
ALSPAUGH	2260	EX-50YR	2610.00	474.03	479.96	478.71	480.19	0.003528	4.80	699.36	259.66	0.42
ALSPAUGH	2260	EX-100YR	3200.00	474.03	480.33	478.89	480.59	0.003587	5.12	796.53	267.22	0.43
ALSPAUGH	2260	EX-500YR	5130.00	474.03	481.24	479.60	481.63	0.003911	6.05	1043.46	273.10	0.46
ALSPAUGH	2260	ULT-100YR	3300.00	474.03	480.38	478.93	480.65	0.003610	5.18	810.63	267.68	0.43
ALSPAUGH	1976	EX-2YR	685.00	472.45	477.33	477.09	477.54	0.003934	5.22	264.43	225.79	0.48
ALSPAUGH	1976	EX-5YR	1225.00	472.45	477.84	477.47	478.09	0.004557	6.13	380.60	230.85	0.53
ALSPAUGH	1976	EX-10YR	1580.00	472.45	478.15	477.66	478.43	0.004568	6.44	453.89	236.09	0.54
ALSPAUGH	1976	EX-25YR	2010.00	472.45	478.45	477.87	478.76	0.004806	6.89	524.42	246.15	0.56
ALSPAUGH	1976	EX-50YR	2610.00	472.45	478.84	478.14	479.20	0.005095	7.48	621.14	272.95	0.58
ALSPAUGH	1976	EX-100YR	3200.00	472.45	479.21	478.36	479.60	0.005026	7.78	731.13	285.35	0.58
ALSPAUGH	1976	EX-500YR	5130.00	472.45	480.05	479.12	480.56	0.005412	8.87	973.03	292.57	0.62
ALSPAUGH	1976	ULT-100YR	3300.00	472.45	479.25	478.40	479.65	0.005095	7.87	742.71	285.62	0.59
ALSPAUGH	1667	EX-2YR	685.00	471.60	475.22	475.22	475.91	0.010144	7.54	128.68	112.93	0.78
ALSPAUGH	1667	EX-5YR	1225.00	471.60	475.99	475.99	476.57	0.008092	7.86	275.59	235.03	0.72
ALSPAUGH	1667	EX-10YR	1580.00	471.60	476.30	476.30	476.91	0.008368	8.43	352.47	268.72	0.74
ALSPAUGH	1667	EX-25YR	2010.00	471.60	476.55	476.55	477.20	0.008774	8.99	422.83	289.94	0.77
ALSPAUGH	1667	EX-50YR	2610.00	471.60	476.84	476.84	477.56	0.009445	9.75	508.68	304.78	0.81
ALSPAUGH	1667	EX-100YR	3200.00	471.60	477.02	477.02	477.87	0.010885	10.75	568.83	333.06	0.87
ALSPAUGH	1667	EX-500YR	5130.00	471.60	477.65	477.65	478.70	0.012459	12.50	794.41	397.40	0.95
ALSPAUGH	1667	ULT-100YR	3300.00	471.60	477.08	477.08	477.92	0.010711	10.76	589.64	340.83	0.87
ALSPAUGH	1174	EX-2YR	680.00	464.10	470.17		470.25	0.001757	3.40	458.75	569.21	0.30
ALSPAUGH	1174	EX-5YR	1220.00	464.10	470.42		470.54	0.002990	4.53	612.73	660.66	0.39
ALSPAUGH	1174	EX-10YR	1575.00	464.10	470.49		470.66	0.004366	5.50	658.15	680.94	0.47
ALSPAUGH	1174	EX-25YR	2000.00	464.10	470.57		470.80	0.005763	6.36	717.22	716.46	0.54
ALSPAUGH	1174	EX-50YR	2610.00	464.10	470.74		471.00	0.007040	7.12	838.25	757.87	0.60
ALSPAUGH	1174	EX-100YR	3190.00	464.10	470.85		471.17	0.008737	8.00	922.65	779.86	0.66
ALSPAUGH	1174	EX-500YR	5120.00	464.10	471.10		471.59	0.012885	9.91	1126.22	799.11	0.81
ALSPAUGH	1174	ULT-100YR	3300.00	464.10	470.83		471.19	0.009789	8.46	908.17	778.66	0.70
ALSPAUGH	1124	EX-2YR	680.00	465.25	470.21	464.57	470.21	0.000008	0.22	4584.10	1910.77	0.02

HEC-RAS Plan: ALSPAUGH-EXIST River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	1124	EX-5YR	1220.00	465.25	470.48	465.36	470.48	0.000017	0.35	5105.84	1938.83	0.03
ALSPAUGH	1124	EX-10YR	1575.00	465.25	470.57	465.81	470.57	0.000026	0.43	5283.48	1958.88	0.04
ALSPAUGH	1124	EX-25YR	2000.00	465.25	470.68	466.52	470.68	0.000037	0.52	5494.17	1973.70	0.04
ALSPAUGH	1124	EX-50YR	2610.00	465.25	470.86	466.83	470.86	0.000052	0.62	5856.91	2006.65	0.05
ALSPAUGH	1124	EX-100YR	3190.00	465.25	471.00	467.01	471.00	0.000068	0.72	6132.96	2018.10	0.06
ALSPAUGH	1124	EX-500YR	5120.00	465.25	471.32	467.56	471.33	0.000128	1.02	6793.81	2057.66	0.08
ALSPAUGH	1124	ULT-100YR	3300.00	465.25	470.99	467.04	471.00	0.000073	0.75	6130.75	2018.01	0.06
ALSPAUGH	1088		Culvert									
ALSPAUGH	1056	EX-2YR	680.00	461.81	466.64		466.67	0.001130	2.19	569.19	522.54	0.22
ALSPAUGH	1056	EX-5YR	1220.00	461.81	467.34		467.37	0.000887	2.10	1081.36	1032.46	0.20
ALSPAUGH	1056	EX-10YR	1575.00	461.81	467.61		467.63	0.000938	2.22	1393.27	1272.25	0.20
ALSPAUGH	1056	EX-25YR	2000.00	461.81	467.91		467.93	0.000850	2.18	1804.37	1484.49	0.19
ALSPAUGH	1056	EX-50YR	2610.00	461.81	468.23		468.25	0.000810	2.19	2288.89	1554.18	0.19
ALSPAUGH	1056	EX-100YR	3190.00	461.81	468.50		468.52	0.000720	2.12	2719.60	1604.43	0.18
ALSPAUGH	1056	EX-500YR	5120.00	461.81	468.89		468.93	0.000994	2.57	3363.05	1677.64	0.21
ALSPAUGH	1056	ULT-100YR	3300.00	461.81	468.50		468.53	0.000767	2.19	2723.71	1604.99	0.19
ALSPAUGH	659	EX-2YR	680.00	461.55	466.40	465.88	466.48	0.006444	3.29	321.49	538.07	0.29
ALSPAUGH	659	EX-5YR	1220.00	461.55	467.28	466.26	467.30	0.001547	1.64	973.94	914.75	0.16
ALSPAUGH	659	EX-10YR	1575.00	461.55	467.55	466.57	467.58	0.001295	1.52	1240.81	1029.60	0.15
ALSPAUGH	659	EX-25YR	2000.00	461.55	467.86	466.61	467.89	0.001154	1.46	1571.75	1112.82	0.15
ALSPAUGH	659	EX-50YR	2610.00	461.55	468.18	466.77	468.21	0.001016	1.40	1944.46	1196.90	0.14
ALSPAUGH	659	EX-100YR	3190.00	461.55	468.46	466.93	468.49	0.000963	1.40	2287.29	1299.53	0.14
ALSPAUGH	659	EX-500YR	5120.00	461.55	468.83	467.21	468.88	0.001543	1.83	2801.28	1461.39	0.18
ALSPAUGH	659	ULT-100YR	3300.00	461.55	468.46	466.87	468.49	0.001031	1.44	2286.82	1299.38	0.15
ALSPAUGH	556	EX-2YR	680.00	461.59	466.33	464.06	466.37	0.000628	1.89	560.42	625.51	0.18
ALSPAUGH	556	EX-5YR	1220.00	461.59	467.23	465.12	467.25	0.000463	1.82	1261.46	1156.81	0.16
ALSPAUGH	556	EX-10YR	1575.00	461.59	467.51	465.43	467.54	0.000481	1.88	1572.41	1350.09	0.16
ALSPAUGH	556	EX-25YR	2000.00	461.59	467.82	465.71	467.84	0.000497	1.96	1956.77	1479.82	0.16
ALSPAUGH	556	EX-50YR	2610.00	461.59	468.15	466.08	468.17	0.000488	2.00	2429.86	1737.41	0.16
ALSPAUGH	556	EX-100YR	3190.00	461.59	468.42	466.62	468.45	0.000494	2.07	2890.44	1895.79	0.16
ALSPAUGH	556	EX-500YR	5120.00	461.59	468.77	467.23	468.82	0.000826	2.77	3502.58	1929.93	0.22
ALSPAUGH	556	ULT-100YR	3300.00	461.59	468.42	466.66	468.45	0.000531	2.15	2885.31	1895.17	0.17
ALSPAUGH	281	EX-2YR	680.00	459.48	465.39	463.98	465.91	0.006141	5.88	128.00	236.30	0.53
ALSPAUGH	281	EX-5YR	1220.00	459.48	466.46	466.41	466.90	0.005410	6.15	353.52	568.83	0.51
ALSPAUGH	281	EX-10YR	1575.00	459.48	466.94	466.65	467.21	0.003836	5.40	575.48	744.87	0.43
ALSPAUGH	281	EX-25YR	2000.00	459.48	467.36	466.91	467.54	0.002944	4.89	900.72	1128.89	0.38

HEC-RAS Plan: ALSPAUGH-EXIST River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	281	EX-50YR	2610.00	459.48	467.75	467.23	467.89	0.002439	4.58	1303.41	1252.97	0.35
ALSPAUGH	281	EX-100YR	3190.00	459.48	468.08	467.18	468.19	0.001939	4.21	1691.63	1466.39	0.31
ALSPAUGH	281	EX-500YR	5120.00	459.48	468.62	467.82	468.72	0.002042	4.58	2421.43	1628.42	0.33
ALSPAUGH	281	ULT-100YR	3300.00	459.48	468.04	467.53	468.16	0.002231	4.49	1636.07	1433.71	0.34
ALSPAUGH	88	EX-2YR	680.00	458.56	463.52	463.34	464.26	0.012902	7.73	108.05	72.42	0.82
ALSPAUGH	88	EX-5YR	1225.00	458.56	464.67	464.39	465.45	0.011393	8.25	189.17	115.20	0.80
ALSPAUGH	88	EX-10YR	1580.00	458.56	465.06	464.84	465.97	0.012699	9.05	227.40	130.15	0.85
ALSPAUGH	88	EX-25YR	2010.00	458.56	465.59	465.46	466.50	0.012273	9.35	301.97	214.98	0.85
ALSPAUGH	88	EX-50YR	2610.00	458.56	466.18	466.18	467.01	0.011038	9.43	441.07	306.90	0.81
ALSPAUGH	88	EX-100YR	3200.00	458.56	466.40	466.39	467.37	0.013010	10.47	513.15	408.00	0.88
ALSPAUGH	88	EX-500YR	5130.00	458.56	467.37	467.37	468.01	0.009295	9.56	1040.05	706.41	0.76
ALSPAUGH	88	ULT-100YR	3300.00	458.56	466.82	466.82	467.42	0.008397	8.73	712.01	569.52	0.72

HEC-RAS Plan: ALSPAUGH-PROP River: ALSPAUGH Reach: ALSPAUGH

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	11471	EX-2YR	400.00	521.61	526.35	523.99	526.46	0.000651	2.63	152.42	51.83	0.26
ALSPAUGH	11471	EX-5YR	620.00	521.61	527.01	524.61	527.18	0.000815	3.32	194.10	79.16	0.30
ALSPAUGH	11471	EX-10YR	815.00	521.61	527.49	525.08	527.71	0.000889	3.77	237.56	96.39	0.33
ALSPAUGH	11471	EX-25YR	1110.00	521.61	528.07	525.66	528.35	0.000986	4.33	307.52	187.94	0.35
ALSPAUGH	11471	EX-50YR	1430.00	521.61	528.68	526.22	528.95	0.000925	4.54	447.48	321.84	0.35
ALSPAUGH	11471	EX-100YR	1880.00	521.61	529.54	526.98	529.72	0.000596	4.03	847.64	506.33	0.28
ALSPAUGH	11471	EX-500YR	3280.00	521.61	530.89	528.74	531.03	0.000466	4.05	1683.19	705.14	0.26
ALSPAUGH	11471	ULT-100YR	1970.00	521.61	529.64	527.16	529.81	0.000585	4.03	898.24	522.92	0.28
ALSPAUGH	11354	EX-2YR	400.00	519.76	526.09	524.07	526.33	0.001858	4.13	118.36	68.48	0.37
ALSPAUGH	11354	EX-5YR	620.00	519.76	526.74	525.44	527.03	0.002045	4.78	166.45	80.38	0.40
ALSPAUGH	11354	EX-10YR	815.00	519.76	527.24	526.16	527.55	0.002061	5.15	210.55	93.68	0.40
ALSPAUGH	11354	EX-25YR	1110.00	519.76	527.84	526.66	528.19	0.002061	5.55	270.81	105.08	0.41
ALSPAUGH	11354	EX-50YR	1430.00	519.76	528.43	527.16	528.80	0.002018	5.87	336.30	118.26	0.41
ALSPAUGH	11354	EX-100YR	1880.00	519.76	529.18	527.65	529.58	0.002098	6.45	452.03	209.37	0.43
ALSPAUGH	11354	EX-500YR	3280.00	519.76	530.55	528.80	530.92	0.001853	6.83	875.69	463.66	0.42
ALSPAUGH	11354	ULT-100YR	1970.00	519.76	529.27	527.73	529.68	0.002090	6.50	472.97	225.39	0.43
ALSPAUGH	11050	EX-2YR	400.00	519.77	524.35	524.35	525.18	0.009613	7.47	60.02	44.77	0.80
ALSPAUGH	11050	EX-5YR	620.00	519.77	525.04	525.04	525.88	0.008017	7.94	96.47	56.50	0.76
ALSPAUGH	11050	EX-10YR	815.00	519.77	525.38	525.38	526.36	0.008606	8.77	116.15	58.84	0.80
ALSPAUGH	11050	EX-25YR	1110.00	519.77	525.87	525.87	526.99	0.008715	9.58	145.72	62.43	0.82
ALSPAUGH	11050	EX-50YR	1430.00	519.77	526.30	526.30	527.58	0.009056	10.41	172.98	65.63	0.85
ALSPAUGH	11050	EX-100YR	1880.00	519.77	526.87	526.87	528.33	0.009016	11.23	212.32	71.23	0.87
ALSPAUGH	11050	EX-500YR	3280.00	519.77	528.63	528.63	529.88	0.006576	11.63	438.56	175.50	0.78
ALSPAUGH	11050	ULT-100YR	1970.00	519.77	527.06	527.06	528.46	0.008336	11.06	226.36	78.27	0.84
ALSPAUGH	10836	EX-2YR	400.00	516.43	523.26		523.36	0.000928	3.06	162.77	64.03	0.25
ALSPAUGH	10836	EX-5YR	620.00	516.43	523.81		523.98	0.001274	3.85	200.77	72.23	0.29
ALSPAUGH	10836	EX-10YR	815.00	516.43	524.41		524.60	0.001312	4.19	246.85	82.95	0.30
ALSPAUGH	10836	EX-25YR	1110.00	516.43	525.29		525.49	0.001233	4.45	327.82	101.76	0.30
ALSPAUGH	10836	EX-50YR	1430.00	516.43	525.97		526.20	0.001467	5.17	416.93	144.98	0.33
ALSPAUGH	10836	EX-100YR	1880.00	516.43	526.60		526.85	0.001408	5.35	510.04	149.31	0.33
ALSPAUGH	10836	EX-500YR	3280.00	516.43	528.12		528.45	0.001397	5.97	744.82	161.81	0.34
ALSPAUGH	10836	ULT-100YR	1970.00	516.43	526.71		526.97	0.001402	5.39	527.28	150.10	0.33
ALSPAUGH	10679	EX-2YR	420.00	518.73	522.74		523.06	0.005056	5.14	108.96	91.05	0.53
ALSPAUGH	10679	EX-5YR	660.00	518.73	523.34		523.64	0.004032	5.21	167.04	100.08	0.49
ALSPAUGH	10679	EX-10YR	870.00	518.73	524.12		524.33	0.002319	4.51	248.79	112.73	0.38
ALSPAUGH	10679	EX-25YR	1180.00	518.73	525.11		525.28	0.001387	4.01	371.92	131.50	0.31
ALSPAUGH	10679	EX-50YR	1520.00	518.73	525.80		525.98	0.001248	4.13	466.43	142.93	0.30

HEC-RAS Plan: ALSPAUGH-PROP River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	10679	EX-100YR	1960.00	518.73	526.41		526.63	0.001346	4.58	563.70	172.96	0.31
ALSPAUGH	10679	EX-500YR	3390.00	518.73	527.96		528.22	0.001377	5.33	896.87	236.76	0.33
ALSPAUGH	10679	ULT-100YR	2050.00	518.73	526.53		526.75	0.001347	4.63	584.03	183.67	0.32
ALSPAUGH	10336	EX-2YR	420.00	516.89	521.48		521.71	0.003173	4.65	119.56	65.36	0.43
ALSPAUGH	10336	EX-5YR	660.00	516.89	522.18		522.46	0.003128	5.19	168.87	75.59	0.44
ALSPAUGH	10336	EX-10YR	870.00	516.89	523.59		523.75	0.001290	4.03	291.09	98.34	0.30
ALSPAUGH	10336	EX-25YR	1180.00	516.89	524.77		524.91	0.000892	3.79	414.40	111.56	0.25
ALSPAUGH	10336	EX-50YR	1520.00	516.89	525.46		525.62	0.000917	4.10	494.40	120.68	0.26
ALSPAUGH	10336	EX-100YR	1960.00	516.89	526.01		526.22	0.001128	4.76	566.65	137.25	0.29
ALSPAUGH	10336	EX-500YR	3390.00	516.89	527.32		527.69	0.001778	6.60	791.28	211.41	0.38
ALSPAUGH	10336	ULT-100YR	2050.00	516.89	526.12		526.34	0.001151	4.85	581.73	139.00	0.30
ALSPAUGH	10027	EX-2YR	420.00	515.82	520.65		520.86	0.002452	4.46	127.90	61.41	0.38
ALSPAUGH	10027	EX-5YR	660.00	515.82	521.22		521.52	0.003072	5.44	164.74	68.33	0.44
ALSPAUGH	10027	EX-10YR	870.00	515.82	523.33		523.44	0.000784	3.51	338.35	96.79	0.24
ALSPAUGH	10027	EX-25YR	1180.00	515.82	524.57		524.68	0.000603	3.44	469.21	113.63	0.21
ALSPAUGH	10027	EX-50YR	1520.00	515.82	525.25		525.38	0.000657	3.79	549.46	122.81	0.23
ALSPAUGH	10027	EX-100YR	1960.00	515.82	525.75		525.92	0.000818	4.38	612.55	129.58	0.25
ALSPAUGH	10027	EX-500YR	3390.00	515.82	526.77		527.14	0.001839	7.05	770.48	194.65	0.39
ALSPAUGH	10027	ULT-100YR	2050.00	515.82	525.85		526.03	0.000846	4.49	625.69	130.95	0.26
ALSPAUGH	9945	EX-2YR	430.00	516.09	519.78	519.78	520.44	0.011955	7.37	74.48	61.24	0.80
ALSPAUGH	9945	EX-5YR	670.00	516.09	520.85		521.22	0.004753	5.84	150.46	78.45	0.54
ALSPAUGH	9945	EX-10YR	860.00	516.09	523.29		523.38	0.000608	2.93	378.25	110.02	0.21
ALSPAUGH	9945	EX-25YR	1180.00	516.09	524.55		524.63	0.000473	2.93	529.70	131.89	0.19
ALSPAUGH	9945	EX-50YR	1540.00	516.09	525.22		525.33	0.000515	3.24	622.08	140.35	0.20
ALSPAUGH	9945	EX-100YR	1990.00	516.09	525.72		525.86	0.000656	3.80	694.27	151.15	0.23
ALSPAUGH	9945	EX-500YR	3430.00	516.09	526.74		527.00	0.001108	5.33	879.30	238.27	0.30
ALSPAUGH	9945	ULT-100YR	2080.00	516.09	525.82		525.96	0.000674	3.89	709.58	152.53	0.23
ALSPAUGH	9627	EX-2YR	430.00	512.87	518.63	516.52	518.78	0.001516	3.34	160.47	95.95	0.30
ALSPAUGH	9627	EX-5YR	670.00	512.87	520.84	517.65	520.88	0.000318	2.07	424.89	153.57	0.15
ALSPAUGH	9627	EX-10YR	860.00	512.87	523.29	518.29	523.31	0.000088	1.37	792.20	197.54	0.08
ALSPAUGH	9627	EX-25YR	1180.00	512.87	524.55	518.81	524.57	0.000074	1.37	1138.40	215.78	0.08
ALSPAUGH	9627	EX-50YR	1540.00	512.87	525.22	519.26	525.25	0.000095	1.62	1294.17	243.66	0.09
ALSPAUGH	9627	EX-100YR	1990.00	512.87	525.72	519.74	525.75	0.000127	1.94	1425.96	308.79	0.10
ALSPAUGH	9627	EX-500YR	3430.00	512.87	526.74	520.72	526.81	0.000239	2.83	1787.12	416.72	0.14
ALSPAUGH	9627	ULT-100YR	2080.00	512.87	525.82	519.81	525.85	0.000142	2.06	1456.32	318.19	0.11
ALSPAUGH	9548	EX-2YR	435.00	512.14	518.54	515.53	518.68	0.000931	3.08	141.21	45.42	0.25

HEC-RAS Plan: ALSPAUGH-PROP River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	9548	EX-5YR	670.00	512.14	520.64	516.28	520.81	0.000640	3.27	204.76	59.91	0.22
ALSPAUGH	9548	EX-10YR	845.00	512.14	523.11	516.75	523.26	0.000362	3.03	279.22	100.45	0.18
ALSPAUGH	9548	EX-25YR	1180.00	512.14	524.45	517.47	524.54	0.000234	2.66	614.81	160.41	0.14
ALSPAUGH	9548	EX-50YR	1560.00	512.14	525.10	518.21	525.21	0.000302	3.15	729.68	214.13	0.17
ALSPAUGH	9548	EX-100YR	2000.00	512.14	525.54	519.01	525.70	0.000411	3.77	834.71	261.98	0.19
ALSPAUGH	9548	EX-500YR	3460.00	512.14	526.46	521.28	526.73	0.000702	5.18	1132.48	383.72	0.26
ALSPAUGH	9548	ULT-100YR	2100.00	512.14	525.64	519.17	525.80	0.000427	3.86	859.14	267.89	0.20
ALSPAUGH	9506		Culvert									
ALSPAUGH	9451	EX-2YR	435.00	511.28	517.25	515.00	517.55	0.002597	4.59	115.42	43.56	0.36
ALSPAUGH	9451	EX-5YR	670.00	511.28	517.73	516.07	518.23	0.004145	6.15	139.08	62.22	0.46
ALSPAUGH	9451	EX-10YR	845.00	511.28	518.12	516.67	518.72	0.004746	6.88	159.31	69.92	0.49
ALSPAUGH	9451	EX-25YR	1180.00	511.28	518.90	517.89	519.56	0.004860	7.56	227.41	83.58	0.51
ALSPAUGH	9451	EX-50YR	1560.00	511.28	519.73	518.75	520.37	0.004395	7.77	301.57	94.18	0.50
ALSPAUGH	9451	EX-100YR	2000.00	511.28	520.50	519.31	521.17	0.004252	8.14	377.81	106.61	0.50
ALSPAUGH	9451	EX-500YR	3460.00	511.28	522.33	520.79	523.11	0.004430	9.48	610.25	158.31	0.52
ALSPAUGH	9451	ULT-100YR	2100.00	511.28	520.65	519.41	521.32	0.004266	8.25	393.60	109.61	0.50
ALSPAUGH	9410	EX-2YR	440.00	512.15	516.53	516.52	517.23	0.011688	7.03	78.06	62.14	0.72
ALSPAUGH	9410	EX-5YR	685.00	512.15	517.44	517.06	517.99	0.007574	6.74	135.21	72.03	0.60
ALSPAUGH	9410	EX-10YR	855.00	512.15	517.92	517.37	518.45	0.006621	6.81	167.71	76.24	0.57
ALSPAUGH	9410	EX-25YR	1200.00	512.15	518.77	517.88	519.26	0.005238	6.82	249.25	93.06	0.53
ALSPAUGH	9410	EX-50YR	1590.00	512.15	519.64	518.44	520.10	0.004256	6.81	337.01	106.65	0.49
ALSPAUGH	9410	EX-100YR	2040.00	512.15	520.42	518.88	520.90	0.003892	7.06	425.49	118.96	0.47
ALSPAUGH	9410	EX-500YR	3520.00	512.15	522.28	520.09	522.82	0.003595	7.96	691.24	163.90	0.47
ALSPAUGH	9410	ULT-100YR	2140.00	512.15	520.57	518.92	521.05	0.003859	7.13	443.37	121.43	0.47
ALSPAUGH	9126	EX-2YR	440.00	508.98	515.53		515.75	0.002543	4.01	128.27	46.24	0.34
ALSPAUGH	9126	EX-5YR	685.00	508.98	516.35		516.66	0.002944	4.85	168.58	51.70	0.38
ALSPAUGH	9126	EX-10YR	855.00	508.98	516.74		517.12	0.003375	5.45	188.93	54.24	0.41
ALSPAUGH	9126	EX-25YR	1200.00	508.98	517.45		517.97	0.004086	6.50	229.22	61.65	0.46
ALSPAUGH	9126	EX-50YR	1590.00	508.98	518.11		518.81	0.004873	7.61	275.35	76.36	0.51
ALSPAUGH	9126	EX-100YR	2040.00	508.98	518.77		519.60	0.005366	8.48	329.83	89.37	0.55
ALSPAUGH	9126	EX-500YR	3520.00	508.98	520.47		521.53	0.005821	10.13	524.21	131.65	0.59
ALSPAUGH	9126	ULT-100YR	2140.00	508.98	518.88		519.74	0.005499	8.67	339.98	91.14	0.55
ALSPAUGH	8731	EX-2YR	460.00	508.07	514.69		514.86	0.002080	3.69	167.48	90.59	0.31
ALSPAUGH	8731	EX-5YR	730.00	508.07	515.53		515.73	0.002034	4.11	248.76	102.85	0.32
ALSPAUGH	8731	EX-10YR	885.00	508.07	515.90		516.11	0.002049	4.33	287.78	106.21	0.32
ALSPAUGH	8731	EX-25YR	1260.00	508.07	516.49		516.76	0.002452	5.06	351.48	112.60	0.36

HEC-RAS Plan: ALSPAUGH-PROP River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	8731	EX-50YR	1670.00	508.07	517.13		517.44	0.002581	5.55	425.63	119.74	0.38
ALSPAUGH	8731	EX-100YR	2140.00	508.07	517.75		518.11	0.002752	6.07	502.96	129.10	0.39
ALSPAUGH	8731	EX-500YR	3660.00	508.07	519.50		519.96	0.002808	7.07	755.78	157.09	0.41
ALSPAUGH	8731	ULT-100YR	2230.00	508.07	517.85		518.22	0.002798	6.18	515.96	130.70	0.40
ALSPAUGH	8436	EX-2YR	675.00	507.53	513.86		514.11	0.002962	4.68	213.77	117.88	0.37
ALSPAUGH	8436	EX-5YR	1120.00	507.53	514.57		514.90	0.003586	5.64	303.75	134.54	0.42
ALSPAUGH	8436	EX-10YR	1370.00	507.53	514.90		515.26	0.003751	5.99	349.53	139.60	0.43
ALSPAUGH	8436	EX-25YR	1800.00	507.53	515.43		515.83	0.003914	6.48	425.66	149.91	0.45
ALSPAUGH	8436	EX-50YR	2340.00	507.53	516.11		516.52	0.003722	6.75	532.03	164.11	0.45
ALSPAUGH	8436	EX-100YR	2890.00	507.53	516.78		517.20	0.003535	6.99	648.01	186.10	0.44
ALSPAUGH	8436	EX-500YR	4690.00	507.53	518.79		519.17	0.002566	6.94	1071.81	239.33	0.39
ALSPAUGH	8436	ULT-100YR	2990.00	507.53	516.90		517.32	0.003444	6.97	671.22	188.32	0.44
ALSPAUGH	8211	EX-2YR	675.00	507.73	513.20	512.67	513.45	0.004830	4.99	199.22	118.36	0.46
ALSPAUGH	8211	EX-5YR	1120.00	507.73	513.85		514.18	0.005398	5.89	282.60	138.03	0.50
ALSPAUGH	8211	EX-10YR	1370.00	507.73	514.22		514.56	0.005041	6.02	336.16	149.23	0.49
ALSPAUGH	8211	EX-25YR	1800.00	507.73	514.82		515.16	0.004458	6.14	427.96	155.91	0.47
ALSPAUGH	8211	EX-50YR	2340.00	507.73	515.58		515.92	0.003880	6.27	554.14	178.11	0.45
ALSPAUGH	8211	EX-100YR	2890.00	507.73	516.37		516.68	0.003018	6.00	698.13	187.69	0.41
ALSPAUGH	8211	EX-500YR	4690.00	507.73	518.53		518.83	0.002010	5.89	1146.45	224.96	0.35
ALSPAUGH	8211	ULT-100YR	2990.00	507.73	516.51		516.82	0.002890	5.96	725.02	189.20	0.40
ALSPAUGH	7986	EX-2YR	675.00	507.75	511.94		512.33	0.005481	5.71	174.29	125.47	0.57
ALSPAUGH	7986	EX-5YR	1120.00	507.75	512.98		513.27	0.003410	5.46	317.93	149.95	0.47
ALSPAUGH	7986	EX-10YR	1370.00	507.75	513.47		513.76	0.002913	5.44	396.33	164.36	0.44
ALSPAUGH	7986	EX-25YR	1800.00	507.75	514.23		514.49	0.002329	5.37	524.95	176.25	0.41
ALSPAUGH	7986	EX-50YR	2340.00	507.75	515.10		515.35	0.001936	5.41	687.79	197.94	0.38
ALSPAUGH	7986	EX-100YR	2890.00	507.75	515.99		516.23	0.001580	5.34	877.85	223.81	0.35
ALSPAUGH	7986	EX-500YR	4690.00	507.75	518.30		518.51	0.001080	5.31	1449.01	273.44	0.30
ALSPAUGH	7986	ULT-100YR	2990.00	507.75	516.16		516.38	0.001500	5.28	914.95	225.33	0.34
ALSPAUGH	7797	EX-2YR	675.00	508.19	511.89		511.93	0.000681	2.07	424.08	185.37	0.21
ALSPAUGH	7797	EX-5YR	1120.00	508.19	512.92		512.97	0.000575	2.29	618.95	194.18	0.20
ALSPAUGH	7797	EX-10YR	1370.00	508.19	513.42		513.48	0.000545	2.41	717.11	198.71	0.20
ALSPAUGH	7797	EX-25YR	1800.00	508.19	514.17		514.24	0.000520	2.60	869.20	205.88	0.20
ALSPAUGH	7797	EX-50YR	2340.00	508.19	515.04		515.13	0.000487	2.77	1052.03	211.72	0.19
ALSPAUGH	7797	EX-100YR	2890.00	508.19	515.94		516.03	0.000444	2.89	1243.99	218.06	0.19
ALSPAUGH	7797	EX-500YR	4690.00	508.19	518.24		518.36	0.000405	3.33	1769.41	235.82	0.19
ALSPAUGH	7797	ULT-100YR	2990.00	508.19	516.10		516.19	0.000436	2.91	1280.02	219.33	0.19

HEC-RAS Plan: ALSPAUGH-PROP River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	7611	EX-2YR	675.00	507.93	511.41		511.69	0.003793	4.28	159.39	66.42	0.47
ALSPAUGH	7611	EX-5YR	1120.00	507.93	512.35		512.75	0.003582	5.11	224.73	71.89	0.48
ALSPAUGH	7611	EX-10YR	1370.00	507.93	512.80		513.26	0.003514	5.49	257.77	74.31	0.48
ALSPAUGH	7611	EX-25YR	1800.00	507.93	513.46		514.02	0.003523	6.09	308.02	77.84	0.50
ALSPAUGH	7611	EX-50YR	2340.00	507.93	514.25		514.91	0.003396	6.64	371.74	83.39	0.50
ALSPAUGH	7611	EX-100YR	2890.00	507.93	515.13		515.82	0.002994	6.88	446.68	87.56	0.48
ALSPAUGH	7611	EX-500YR	4690.00	507.93	517.26		518.15	0.002675	7.90	645.12	99.05	0.48
ALSPAUGH	7611	ULT-100YR	2990.00	507.93	515.29		515.99	0.002913	6.91	461.22	88.35	0.48
ALSPAUGH	7436	EX-2YR	675.00	506.14	509.65		510.45	0.015424	7.21	93.68	46.56	0.90
ALSPAUGH	7436	EX-5YR	1120.00	506.14	510.42	510.28	511.56	0.014677	8.57	131.34	51.58	0.92
ALSPAUGH	7436	EX-10YR	1370.00	506.14	510.83	510.65	512.10	0.013568	9.06	153.32	54.62	0.90
ALSPAUGH	7436	EX-25YR	1800.00	506.14	511.68	511.29	512.97	0.010173	9.20	201.76	59.73	0.81
ALSPAUGH	7436	EX-50YR	2340.00	506.14	512.86		514.04	0.006738	8.91	277.29	67.15	0.69
ALSPAUGH	7436	EX-100YR	2890.00	506.14	514.06		515.13	0.004728	8.58	361.61	73.26	0.60
ALSPAUGH	7436	EX-500YR	4690.00	506.14	516.22		517.53	0.004104	9.71	538.57	90.51	0.59
ALSPAUGH	7436	ULT-100YR	2990.00	506.14	514.27		515.33	0.004514	8.56	376.57	75.00	0.59
ALSPAUGH	7159	EX-2YR	675.00	503.00	507.57		508.04	0.005244	5.62	124.06	45.41	0.56
ALSPAUGH	7159	EX-5YR	1120.00	503.00	509.02		509.54	0.003792	5.96	198.01	56.12	0.51
ALSPAUGH	7159	EX-10YR	1370.00	503.00	509.77		510.30	0.003150	6.05	242.30	61.23	0.47
ALSPAUGH	7159	EX-25YR	1800.00	503.00	511.03		511.55	0.002375	6.09	324.92	70.21	0.43
ALSPAUGH	7159	EX-50YR	2340.00	503.00	512.46		512.97	0.001835	6.13	433.72	82.04	0.39
ALSPAUGH	7159	EX-100YR	2890.00	503.00	513.80		514.30	0.001476	6.11	551.27	93.15	0.36
ALSPAUGH	7159	EX-500YR	4690.00	503.00	516.02		516.69	0.001563	7.27	776.56	109.77	0.38
ALSPAUGH	7159	ULT-100YR	2990.00	503.00	514.02		514.51	0.001433	6.12	571.93	94.97	0.35
ALSPAUGH	7012	EX-2YR	675.00	502.98	507.06	506.08	507.51	0.002620	5.55	129.54	74.90	0.54
ALSPAUGH	7012	EX-5YR	1120.00	502.98	508.67	506.92	509.17	0.001733	5.87	203.95	85.83	0.47
ALSPAUGH	7012	EX-10YR	1370.00	502.98	509.46	507.35	509.99	0.001536	6.09	239.94	89.73	0.45
ALSPAUGH	7012	EX-25YR	1800.00	502.98	510.70	507.97	511.29	0.001325	6.44	297.09	98.39	0.43
ALSPAUGH	7012	EX-50YR	2340.00	502.98	512.06	508.67	512.74	0.001197	6.90	359.72	106.20	0.42
ALSPAUGH	7012	EX-100YR	2890.00	502.98	513.31	509.34	514.08	0.001121	7.33	417.32	113.64	0.42
ALSPAUGH	7012	EX-500YR	4690.00	502.98	516.13	511.24	516.48	0.000479	5.69	1116.18	136.95	0.29
ALSPAUGH	7012	ULT-100YR	2990.00	502.98	513.51	509.43	514.30	0.001117	7.41	426.56	115.13	0.42
ALSPAUGH	6989	EX-2YR	675.00	502.69	505.80	505.80	507.14	0.010108	9.30	73.43	28.94	0.99
ALSPAUGH	6989	EX-5YR	1120.00	502.69	506.89	506.89	508.70	0.008814	10.87	106.34	30.87	0.98
ALSPAUGH	6989	EX-10YR	1370.00	502.69	507.44	507.44	509.47	0.008344	11.56	123.34	31.52	0.97
ALSPAUGH	6989	EX-25YR	1800.00	502.69	508.25	508.25	510.68	0.008032	12.70	149.19	32.55	0.98
ALSPAUGH	6989	EX-50YR	2340.00	502.69	509.24	509.24	512.05	0.007394	13.70	182.50	34.41	0.97

HEC-RAS Plan: ALSPAUGH-PROP River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	6989	EX-100YR	2890.00	502.69	510.13	510.13	513.31	0.007070	14.65	213.64	36.40	0.97
ALSPAUGH	6989	EX-500YR	4690.00	502.69	513.95	513.95	515.95	0.002977	12.68	536.76	137.77	0.68
ALSPAUGH	6989	ULT-100YR	2990.00	502.69	510.31	510.31	513.52	0.006915	14.73	220.47	38.06	0.97
ALSPAUGH	6963	EX-2YR	675.00	502.03	504.70	504.70	505.57	0.014348	7.79	91.01	93.43	0.99
ALSPAUGH	6963	EX-5YR	1120.00	502.03	505.40	505.40	506.61	0.013005	9.12	127.36	100.24	1.00
ALSPAUGH	6963	EX-10YR	1370.00	502.03	505.75	505.75	507.14	0.012538	9.74	145.40	102.66	1.00
ALSPAUGH	6963	EX-25YR	1800.00	502.03	506.30	506.30	507.97	0.011936	10.64	173.94	105.87	1.00
ALSPAUGH	6963	EX-50YR	2340.00	502.03	506.94	506.94	508.92	0.011259	11.56	207.27	111.38	1.00
ALSPAUGH	6963	EX-100YR	2890.00	502.03	507.55	507.55	509.83	0.010707	12.35	238.90	114.65	1.00
ALSPAUGH	6963	EX-500YR	4690.00	502.03	509.29	509.29	512.44	0.009660	14.45	329.57	123.10	1.00
ALSPAUGH	6963	ULT-100YR	2990.00	502.03	507.64	507.64	509.98	0.010686	12.51	243.98	115.04	1.00
ALSPAUGH	6569	EX-2YR	675.00	496.60	501.10		501.24	0.002759	4.08	250.96	150.16	0.40
ALSPAUGH	6569	EX-5YR	1120.00	496.60	501.71		501.90	0.002993	4.76	344.17	156.47	0.43
ALSPAUGH	6569	EX-10YR	1370.00	496.60	502.01		502.22	0.003069	5.07	391.20	161.22	0.44
ALSPAUGH	6569	EX-25YR	1800.00	496.60	502.39		502.66	0.003403	5.66	454.63	166.89	0.47
ALSPAUGH	6569	EX-50YR	2340.00	496.60	502.85		503.17	0.003641	6.23	531.91	175.03	0.49
ALSPAUGH	6569	EX-100YR	2890.00	496.60	503.25		503.63	0.003826	6.73	603.22	179.72	0.51
ALSPAUGH	6569	EX-500YR	4690.00	496.60	504.01	502.73	504.67	0.005422	8.75	744.56	189.55	0.62
ALSPAUGH	6569	ULT-100YR	2990.00	496.60	503.31		503.71	0.003879	6.83	614.37	180.42	0.51
ALSPAUGH	5732	EX-2YR	785.00	495.35	497.52	497.52	497.93	0.023073	7.24	170.67	181.54	0.97
ALSPAUGH	5732	EX-5YR	1305.00	495.35	497.84	497.84	498.42	0.025585	8.52	228.02	183.55	1.04
ALSPAUGH	5732	EX-10YR	1630.00	495.35	498.03	498.03	498.69	0.025320	8.99	263.11	184.87	1.05
ALSPAUGH	5732	EX-25YR	2010.00	495.35	498.21	498.21	498.99	0.026053	9.61	297.51	186.37	1.08
ALSPAUGH	5732	EX-50YR	2610.00	495.35	498.52	498.52	499.42	0.025064	10.20	355.15	189.63	1.08
ALSPAUGH	5732	EX-100YR	3190.00	495.35	498.77	498.77	499.81	0.024907	10.79	403.82	191.94	1.10
ALSPAUGH	5732	EX-500YR	5130.00	495.35	500.18		501.10	0.012230	9.77	682.34	203.08	0.82
ALSPAUGH	5732	ULT-100YR	3300.00	495.35	498.84	498.82	499.88	0.024290	10.80	415.78	192.41	1.09
ALSPAUGH	5148	EX-2YR	785.00	491.14	494.56		494.62	0.002110	2.37	391.70	222.74	0.29
ALSPAUGH	5148	EX-5YR	1305.00	491.14	495.15		495.24	0.002315	2.91	524.86	233.03	0.32
ALSPAUGH	5148	EX-10YR	1630.00	491.14	495.47		495.59	0.002332	3.16	602.07	236.53	0.32
ALSPAUGH	5148	EX-25YR	2010.00	491.14	495.85		495.98	0.002306	3.40	691.25	241.97	0.33
ALSPAUGH	5148	EX-50YR	2610.00	491.14	496.44		496.59	0.002157	3.67	836.51	250.63	0.33
ALSPAUGH	5148	EX-100YR	3190.00	491.14	496.98		497.14	0.001988	3.84	972.49	254.18	0.32
ALSPAUGH	5148	EX-500YR	5130.00	491.14	499.53		499.68	0.000992	3.67	1652.13	277.83	0.24
ALSPAUGH	5148	ULT-100YR	3300.00	491.14	497.06		497.24	0.001978	3.88	994.77	254.75	0.32
ALSPAUGH	4570	EX-2YR	785.00	487.51	492.65		493.00	0.007562	6.19	208.62	154.21	0.58

HEC-RAS Plan: ALSPAUGH-PROP River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	4570	EX-5YR	1305.00	487.51	493.39		493.72	0.006009	6.27	329.66	168.52	0.53
ALSPAUGH	4570	EX-10YR	1630.00	487.51	493.87		494.18	0.005039	6.16	411.26	178.35	0.50
ALSPAUGH	4570	EX-25YR	2010.00	487.51	494.41		494.70	0.004091	5.97	511.53	187.74	0.46
ALSPAUGH	4570	EX-50YR	2610.00	487.51	495.19		495.48	0.003325	5.89	662.90	205.47	0.42
ALSPAUGH	4570	EX-100YR	3190.00	487.51	495.91		496.18	0.002728	5.75	813.64	215.56	0.39
ALSPAUGH	4570	EX-500YR	5130.00	487.51	499.08		499.26	0.001048	4.60	1558.23	255.21	0.26
ALSPAUGH	4570	ULT-100YR	3300.00	487.51	496.00		496.28	0.002700	5.78	835.04	216.46	0.39
ALSPAUGH	4318	EX-2YR	785.00	487.30	492.29		492.37	0.002100	3.36	401.82	283.15	0.34
ALSPAUGH	4318	EX-5YR	1305.00	487.30	493.28		493.34	0.001113	2.96	690.42	298.45	0.26
ALSPAUGH	4318	EX-10YR	1630.00	487.30	493.80		493.86	0.000914	2.91	846.88	302.82	0.24
ALSPAUGH	4318	EX-25YR	2010.00	487.30	494.37		494.44	0.000764	2.88	1023.26	306.65	0.23
ALSPAUGH	4318	EX-50YR	2610.00	487.30	495.18		495.25	0.000643	2.92	1272.87	311.88	0.21
ALSPAUGH	4318	EX-100YR	3190.00	487.30	495.91		495.98	0.000572	2.97	1502.39	319.55	0.20
ALSPAUGH	4318	EX-500YR	5130.00	487.30	499.10		499.17	0.000280	2.71	2563.56	347.41	0.15
ALSPAUGH	4318	ULT-100YR	3300.00	487.30	496.01		496.08	0.000573	3.01	1534.52	320.14	0.20
ALSPAUGH	4252	EX-2YR	790.00	485.64	490.97	490.97	491.87	0.008767	8.49	125.01	262.42	0.71
ALSPAUGH	4252	EX-5YR	1315.00	485.64	491.82	491.82	492.88	0.009025	9.67	188.58	315.82	0.74
ALSPAUGH	4252	EX-10YR	1640.00	485.64	492.18	492.18	493.37	0.009627	10.43	216.65	338.19	0.77
ALSPAUGH	4252	EX-25YR	2030.00	485.64	492.55	492.55	493.92	0.010223	11.22	246.52	351.76	0.80
ALSPAUGH	4252	EX-50YR	2620.00	485.64	493.07	493.07	494.67	0.010882	12.22	287.06	365.72	0.84
ALSPAUGH	4252	EX-100YR	3190.00	485.64	493.52	493.52	495.35	0.011321	13.03	322.76	382.29	0.87
ALSPAUGH	4252	EX-500YR	5040.00	485.64	499.11	494.82	499.14	0.000124	2.02	3670.20	511.73	0.10
ALSPAUGH	4252	ULT-100YR	3270.00	485.64	493.57	493.57	495.44	0.011449	13.17	326.83	383.37	0.87
ALSPAUGH	4185		Culvert									
ALSPAUGH	4105	EX-2YR	790.00	482.96	490.19	487.68	490.53	0.002206	5.03	190.77	192.86	0.36
ALSPAUGH	4105	EX-5YR	1315.00	482.96	490.67	489.34	491.33	0.004037	7.17	227.49	283.85	0.50
ALSPAUGH	4105	EX-10YR	1640.00	482.96	490.99	490.30	491.82	0.004850	8.12	251.56	307.88	0.55
ALSPAUGH	4105	EX-25YR	2030.00	482.96	491.27	490.79	492.33	0.005980	9.26	272.78	310.70	0.62
ALSPAUGH	4105	EX-50YR	2620.00	482.96	491.67	491.38	493.07	0.007414	10.70	303.25	319.00	0.69
ALSPAUGH	4105	EX-100YR	3190.00	482.96	491.87	491.87	493.72	0.009540	12.36	318.62	322.11	0.79
ALSPAUGH	4105	EX-500YR	5040.00	482.96	494.60	492.75	494.75	0.000729	4.20	1721.61	358.16	0.23
ALSPAUGH	4105	ULT-100YR	3270.00	482.96	491.92	491.92	493.82	0.009686	12.51	322.42	322.55	0.80
ALSPAUGH	3874	EX-2YR	790.00	482.95	489.04	489.04	489.67	0.006517	7.13	162.29	151.20	0.60
ALSPAUGH	3874	EX-5YR	1315.00	482.95	489.65	489.65	490.30	0.006855	7.98	263.75	178.65	0.63
ALSPAUGH	3874	EX-10YR	1640.00	482.95	489.83	489.83	490.60	0.008008	8.83	296.97	182.69	0.69
ALSPAUGH	3874	EX-25YR	2030.00	482.95	490.18	490.18	490.91	0.007524	8.94	363.74	195.35	0.67

HEC-RAS Plan: ALSPAUGH-PROP River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	3874	EX-50YR	2620.00	482.95	490.40	490.40	491.33	0.009209	10.16	407.56	198.58	0.75
ALSPAUGH	3874	EX-100YR	3190.00	482.95	491.29		491.87	0.004907	8.17	600.13	236.58	0.56
ALSPAUGH	3874	EX-500YR	5040.00	482.95	494.39		494.60	0.001020	4.81	1467.56	316.11	0.27
ALSPAUGH	3874	ULT-100YR	3270.00	482.95	491.44		491.98	0.004435	7.88	636.79	246.36	0.53
ALSPAUGH	3726	EX-2YR	790.00	484.05	487.97	487.97	488.57	0.007678	6.66	155.09	154.22	0.68
ALSPAUGH	3726	EX-5YR	1315.00	484.05	488.55	488.55	489.16	0.007366	7.33	252.31	179.31	0.68
ALSPAUGH	3726	EX-10YR	1640.00	484.05	488.75	488.75	489.45	0.008067	7.96	289.69	183.85	0.72
ALSPAUGH	3726	EX-25YR	2030.00	484.05	488.99	488.99	489.77	0.008485	8.50	333.68	189.18	0.75
ALSPAUGH	3726	EX-50YR	2620.00	484.05	489.73		490.30	0.005216	7.45	481.30	207.34	0.60
ALSPAUGH	3726	EX-100YR	3190.00	484.05	491.10		491.40	0.001917	5.35	790.46	241.58	0.38
ALSPAUGH	3726	EX-500YR	5040.00	484.05	494.32		494.49	0.000583	3.91	1670.64	310.93	0.23
ALSPAUGH	3726	ULT-100YR	3270.00	484.05	491.27		491.56	0.001734	5.18	832.30	243.20	0.36
ALSPAUGH	3487	EX-2YR	790.00	483.07	484.83		484.96	0.003016	2.11	269.52	189.24	0.36
ALSPAUGH	3487	EX-5YR	1315.00	483.07	486.64		486.70	0.000552	1.75	629.13	207.51	0.18
ALSPAUGH	3487	EX-10YR	1640.00	483.07	487.57		487.63	0.000362	1.71	826.62	215.11	0.15
ALSPAUGH	3487	EX-25YR	2030.00	483.07	488.61		488.67	0.000260	1.70	1053.53	222.67	0.14
ALSPAUGH	3487	EX-50YR	2620.00	483.07	489.96		490.02	0.000196	1.74	1362.74	235.81	0.12
ALSPAUGH	3487	EX-100YR	3190.00	483.07	491.18		491.24	0.000160	1.78	1659.22	247.97	0.12
ALSPAUGH	3487	EX-500YR	5040.00	483.07	494.34		494.41	0.000120	1.95	2482.77	276.22	0.11
ALSPAUGH	3487	ULT-100YR	3270.00	483.07	491.35		491.41	0.000157	1.78	1699.99	249.99	0.11
ALSPAUGH	3234	EX-2YR	790.00	478.67	484.81	481.47	484.84	0.000142	1.35	644.47	262.78	0.10
ALSPAUGH	3234	EX-5YR	1315.00	478.67	486.60	481.89	486.64	0.000127	1.54	907.75	277.71	0.10
ALSPAUGH	3234	EX-10YR	1640.00	478.67	487.54	482.11	487.58	0.000124	1.65	1044.98	285.15	0.10
ALSPAUGH	3234	EX-25YR	2030.00	478.67	488.57	482.36	488.62	0.000122	1.77	1197.26	291.88	0.10
ALSPAUGH	3234	EX-50YR	2620.00	478.67	489.92	482.69	489.98	0.000122	1.94	1395.33	315.46	0.10
ALSPAUGH	3234	EX-100YR	3190.00	478.67	491.14	482.99	491.21	0.000121	2.08	1574.60	337.81	0.11
ALSPAUGH	3234	EX-500YR	5040.00	478.67	494.35	483.87	494.38	0.000044	1.47	3982.27	377.37	0.07
ALSPAUGH	3234	ULT-100YR	3270.00	478.67	491.30	483.04	491.37	0.000121	2.10	1598.50	340.39	0.11
ALSPAUGH	3141	EX-2YR	785.00	479.32	483.49		484.50	0.009838	8.10	99.83	33.71	0.78
ALSPAUGH	3141	EX-5YR	1310.00	479.32	484.19	484.19	486.05	0.014203	11.05	124.29	35.96	0.97
ALSPAUGH	3141	EX-10YR	1635.00	479.32	484.82	484.82	486.92	0.013359	11.80	147.38	37.45	0.96
ALSPAUGH	3141	EX-25YR	2030.00	479.32	485.51	485.51	487.89	0.012682	12.61	173.88	39.17	0.96
ALSPAUGH	3141	EX-50YR	2600.00	479.32	486.42	486.42	489.14	0.011984	13.60	210.35	41.43	0.96
ALSPAUGH	3141	EX-100YR	3160.00	479.32	487.20	487.20	490.27	0.011656	14.51	243.78	44.15	0.96
ALSPAUGH	3141	EX-500YR	4930.00	479.32	489.49	489.49	493.25	0.010180	16.35	354.70	52.19	0.94
ALSPAUGH	3141	ULT-100YR	3240.00	479.32	487.32	487.32	490.43	0.011544	14.60	249.10	44.70	0.96

HEC-RAS Plan: ALSPAUGH-PROP River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	3040	EX-2YR	785.00	478.83	482.88	482.73	483.41	0.007850	6.72	158.63	121.20	0.68
ALSPAUGH	3040	EX-5YR	1310.00	478.83	484.02		484.44	0.004447	6.26	276.24	135.74	0.54
ALSPAUGH	3040	EX-10YR	1635.00	478.83	484.66		485.06	0.003550	6.15	345.28	141.77	0.50
ALSPAUGH	3040	EX-25YR	2030.00	478.83	485.36		485.76	0.002932	6.13	423.65	148.16	0.46
ALSPAUGH	3040	EX-50YR	2600.00	478.83	486.29		486.70	0.002407	6.16	530.09	153.88	0.43
ALSPAUGH	3040	EX-100YR	3160.00	478.83	487.11		487.54	0.002120	6.27	626.18	158.67	0.41
ALSPAUGH	3040	EX-500YR	4930.00	478.83	488.90		489.49	0.002473	7.84	889.84	172.67	0.46
ALSPAUGH	3040	ULT-100YR	3240.00	478.83	487.21		487.64	0.002109	6.31	637.41	159.22	0.41
ALSPAUGH	2587	EX-2YR	785.00	475.19	481.15		481.55	0.003213	5.62	164.36	45.54	0.45
ALSPAUGH	2587	EX-5YR	1310.00	475.19	482.20		482.86	0.004133	7.27	213.63	48.50	0.53
ALSPAUGH	2587	EX-10YR	1635.00	475.19	482.75		483.56	0.004515	8.07	241.14	50.08	0.56
ALSPAUGH	2587	EX-25YR	2030.00	475.19	483.28		484.29	0.005120	9.06	267.90	51.56	0.61
ALSPAUGH	2587	EX-50YR	2600.00	475.19	483.94		485.24	0.005913	10.34	302.30	53.42	0.66
ALSPAUGH	2587	EX-100YR	3160.00	475.19	484.63	483.16	486.11	0.006162	11.19	345.90	95.73	0.68
ALSPAUGH	2587	EX-500YR	4930.00	475.19	486.26	485.63	487.98	0.006237	12.69	519.10	112.60	0.71
ALSPAUGH	2587	ULT-100YR	3240.00	475.19	484.70	483.25	486.21	0.006233	11.32	353.03	100.05	0.69
ALSPAUGH	2454	EX-2YR	795.00	474.63	479.37	479.37	480.55	0.019715	8.77	93.46	49.03	0.94
ALSPAUGH	2454	EX-5YR	1325.00	474.63	480.48	480.48	481.78	0.014559	9.50	158.39	63.02	0.86
ALSPAUGH	2454	EX-10YR	1660.00	474.63	480.90	480.90	482.40	0.015008	10.34	185.08	64.90	0.89
ALSPAUGH	2454	EX-25YR	2050.00	474.63	481.41	481.41	483.06	0.014466	10.96	219.13	68.46	0.89
ALSPAUGH	2454	EX-50YR	2620.00	474.63	482.06	482.06	483.91	0.014059	11.77	265.31	73.59	0.89
ALSPAUGH	2454	EX-100YR	3180.00	474.63	482.44	482.44	484.67	0.015782	13.04	293.31	76.53	0.96
ALSPAUGH	2454	EX-500YR	4960.00	474.63	484.15	484.15	486.59	0.013072	14.12	444.53	100.53	0.91
ALSPAUGH	2454	ULT-100YR	3270.00	474.63	482.56	482.56	484.77	0.015291	13.02	302.80	77.35	0.95
ALSPAUGH	2260	EX-2YR	795.00	474.03	478.70	478.70	478.77	0.001885	2.75	396.23	228.12	0.29
ALSPAUGH	2260	EX-5YR	1325.00	474.03	478.97	478.70	479.11	0.003323	3.87	457.38	230.25	0.39
ALSPAUGH	2260	EX-10YR	1660.00	474.03	479.26	478.71	479.43	0.003377	4.14	525.57	235.22	0.39
ALSPAUGH	2260	EX-25YR	2050.00	474.03	479.57	478.71	479.76	0.003485	4.46	599.76	247.62	0.41
ALSPAUGH	2260	EX-50YR	2620.00	474.03	479.97	478.71	480.20	0.003529	4.80	701.06	260.09	0.42
ALSPAUGH	2260	EX-100YR	3180.00	474.03	480.32	478.88	480.58	0.003584	5.11	793.57	267.12	0.43
ALSPAUGH	2260	EX-500YR	4960.00	474.03	481.17	479.53	481.54	0.003900	5.98	1022.52	272.57	0.46
ALSPAUGH	2260	ULT-100YR	3270.00	474.03	480.37	478.92	480.63	0.003604	5.16	806.35	267.54	0.43
ALSPAUGH	1976	EX-2YR	795.00	472.45	477.41	477.17	477.64	0.004466	5.64	281.82	226.58	0.51
ALSPAUGH	1976	EX-5YR	1325.00	472.45	478.00	477.53	478.24	0.004061	5.93	417.81	232.44	0.50
ALSPAUGH	1976	EX-10YR	1660.00	472.45	478.20	477.70	478.49	0.004666	6.56	465.91	236.66	0.54
ALSPAUGH	1976	EX-25YR	2050.00	472.45	478.50	477.89	478.80	0.004687	6.85	535.82	248.90	0.55
ALSPAUGH	1976	EX-50YR	2620.00	472.45	478.85	478.14	479.21	0.005066	7.47	623.89	273.35	0.58

HEC-RAS Plan: ALSPAUGH-PROP River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	1976	EX-100YR	3180.00	472.45	479.19	478.36	479.58	0.005066	7.79	726.22	285.24	0.58
ALSPAUGH	1976	EX-500YR	4960.00	472.45	479.94	479.07	480.46	0.005598	8.92	941.70	291.88	0.63
ALSPAUGH	1976	ULT-100YR	3270.00	472.45	479.23	478.40	479.63	0.005110	7.87	737.56	285.50	0.59
ALSPAUGH	1667	EX-2YR	790.00	471.60	475.52	475.52	476.09	0.008004	7.14	175.55	183.48	0.70
ALSPAUGH	1667	EX-5YR	1320.00	471.60	475.96	475.96	476.67	0.010036	8.70	267.00	233.09	0.80
ALSPAUGH	1667	EX-10YR	1655.00	471.60	476.35	476.35	476.96	0.008321	8.48	367.42	272.11	0.74
ALSPAUGH	1667	EX-25YR	2050.00	471.60	476.54	476.54	477.23	0.009228	9.21	420.89	289.53	0.79
ALSPAUGH	1667	EX-50YR	2620.00	471.60	476.84	476.84	477.56	0.009482	9.77	509.44	304.95	0.81
ALSPAUGH	1667	EX-100YR	3170.00	471.60	477.01	477.01	477.86	0.010832	10.71	565.54	332.26	0.87
ALSPAUGH	1667	EX-500YR	4950.00	471.60	477.66	477.66	478.63	0.011457	12.00	798.51	399.11	0.92
ALSPAUGH	1667	ULT-100YR	3260.00	471.60	477.06	477.06	477.90	0.010783	10.76	581.08	337.51	0.87
ALSPAUGH	1174	EX-2YR	281.41	464.10	470.21		470.43	0.002121	3.75	75.10	18.17	0.32
ALSPAUGH	1174	EX-5YR	382.71	464.10	470.32		470.70	0.003662	4.97	77.04	18.35	0.43
ALSPAUGH	1174	EX-10YR	452.51	464.10	470.37		470.89	0.004950	5.80	78.01	18.44	0.50
ALSPAUGH	1174	EX-25YR	522.78	464.10	470.42		471.10	0.006412	6.63	78.88	18.53	0.57
ALSPAUGH	1174	EX-50YR	629.25	464.10	470.45		471.43	0.009079	7.91	79.56	18.59	0.67
ALSPAUGH	1174	EX-100YR	705.82	464.10	470.48		471.69	0.011259	8.82	79.98	18.63	0.75
ALSPAUGH	1174	EX-500YR	905.43	464.10	470.55	470.35	472.47	0.017683	11.13	81.38	18.76	0.94
ALSPAUGH	1174	ULT-100YR	741.85	464.10	470.46		471.81	0.012556	9.31	79.70	18.60	0.79
ALSPAUGH	1124	EX-2YR	368.83	465.25	469.93	467.94	470.26	0.003382	4.61	79.99	20.39	0.41
ALSPAUGH	1124	EX-5YR	397.12	465.25	470.17	468.06	470.51	0.003321	4.68	84.84	20.70	0.41
ALSPAUGH	1124	EX-10YR	408.37	465.25	470.26	468.12	470.60	0.003298	4.71	86.75	20.82	0.41
ALSPAUGH	1124	EX-25YR	420.23	465.25	470.35	468.16	470.70	0.003274	4.73	88.77	20.95	0.41
ALSPAUGH	1124	EX-50YR	436.37	465.25	470.48	468.23	470.84	0.003242	4.77	91.51	21.13	0.40
ALSPAUGH	1124	EX-100YR	449.49	465.25	470.59	468.29	470.95	0.003217	4.80	93.72	21.27	0.40
ALSPAUGH	1124	EX-500YR	492.27	465.25	470.92	468.46	471.29	0.003138	4.88	100.92	21.72	0.40
ALSPAUGH	1124	ULT-100YR	453.56	465.25	470.62	468.31	470.98	0.003209	4.80	94.41	21.31	0.40
ALSPAUGH	1088		Culvert									
ALSPAUGH	1051	EX-2YR	790.00	461.81	466.81		466.84	0.001054	2.16	662.26	584.01	0.21
ALSPAUGH	1051	EX-5YR	1320.00	461.81	467.41		467.43	0.000924	2.16	1154.36	1111.16	0.20
ALSPAUGH	1051	EX-10YR	1655.00	461.81	467.68		467.70	0.000897	2.19	1484.45	1320.98	0.20
ALSPAUGH	1051	EX-25YR	2050.00	461.81	467.93		467.95	0.000852	2.19	1834.69	1494.99	0.20
ALSPAUGH	1051	EX-50YR	2620.00	461.81	468.23		468.25	0.000813	2.20	2292.11	1554.84	0.19
ALSPAUGH	1051	EX-100YR	3170.00	461.81	468.46		468.48	0.000770	2.18	2651.44	1595.16	0.19
ALSPAUGH	1051	EX-500YR	4950.00	461.81	469.04		469.07	0.000751	2.26	3619.79	1712.07	0.19
ALSPAUGH	1051	ULT-100YR	3260.00	461.81	468.49		468.51	0.000773	2.19	2695.88	1601.21	0.19

HEC-RAS Plan: ALSPAUGH-PROP River: ALSPAUGH Reach: ALSPAUGH (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ALSPAUGH	659	EX-2YR	790.00	461.55	466.66	465.94	466.71	0.004422	2.76	477.87	680.53	0.24
ALSPAUGH	659	EX-5YR	1320.00	461.55	467.35	466.39	467.38	0.001570	1.65	1042.24	941.09	0.16
ALSPAUGH	659	EX-10YR	1655.00	461.55	467.63	466.47	467.66	0.001264	1.50	1322.91	1061.11	0.15
ALSPAUGH	659	EX-25YR	2050.00	461.55	467.89	466.62	467.91	0.001144	1.45	1600.45	1125.55	0.15
ALSPAUGH	659	EX-50YR	2620.00	461.55	468.19	466.78	468.22	0.001010	1.40	1952.60	1199.28	0.14
ALSPAUGH	659	EX-100YR	3170.00	461.55	468.42	466.88	468.45	0.001020	1.43	2235.09	1283.50	0.14
ALSPAUGH	659	EX-500YR	4950.00	461.55	469.00	467.18	469.04	0.001114	1.58	3059.07	1520.30	0.16
ALSPAUGH	659	ULT-100YR	3260.00	461.55	468.45	466.90	468.48	0.001029	1.44	2270.30	1294.15	0.15
ALSPAUGH	556	EX-2YR	790.00	461.59	466.59	464.27	466.62	0.000565	1.86	713.98	858.47	0.17
ALSPAUGH	556	EX-5YR	1320.00	461.59	467.30	465.22	467.33	0.000475	1.85	1337.13	1206.87	0.16
ALSPAUGH	556	EX-10YR	1655.00	461.59	467.59	465.48	467.61	0.000479	1.88	1667.54	1372.22	0.16
ALSPAUGH	556	EX-25YR	2050.00	461.59	467.84	465.71	467.87	0.000498	1.97	1991.34	1490.49	0.16
ALSPAUGH	556	EX-50YR	2620.00	461.59	468.15	466.07	468.18	0.000486	2.00	2440.95	1741.37	0.16
ALSPAUGH	556	EX-100YR	3170.00	461.59	468.38	466.61	468.41	0.000523	2.12	2815.95	1877.44	0.17
ALSPAUGH	556	EX-500YR	4950.00	461.59	468.97	467.19	469.02	0.000136	1.15	4881.22	1934.35	0.09
ALSPAUGH	556	ULT-100YR	3260.00	461.59	468.41	466.65	468.44	0.000529	2.14	2863.12	1890.63	0.17
ALSPAUGH	281	EX-2YR	790.00	459.48	465.56	464.29	466.18	0.007081	6.44	143.29	274.93	0.57
ALSPAUGH	281	EX-5YR	1320.00	459.48	466.61	466.51	466.98	0.004800	5.87	414.82	592.50	0.48
ALSPAUGH	281	EX-10YR	1655.00	459.48	467.04	466.70	467.29	0.003646	5.31	638.10	848.00	0.42
ALSPAUGH	281	EX-25YR	2050.00	459.48	467.39	466.93	467.56	0.002866	4.84	934.80	1142.69	0.38
ALSPAUGH	281	EX-50YR	2620.00	459.48	467.77	467.23	467.90	0.002394	4.54	1316.79	1259.52	0.35
ALSPAUGH	281	EX-100YR	3170.00	459.48	468.01	467.20	468.12	0.002198	4.45	1592.86	1408.14	0.33
ALSPAUGH	281	EX-500YR	4950.00	459.48	468.58	467.90	468.68	0.002027	4.54	2363.43	1621.55	0.32
ALSPAUGH	281	ULT-100YR	3260.00	459.48	468.03	467.52	468.15	0.002225	4.48	1621.31	1424.82	0.34
ALSPAUGH	88	EX-2YR	795.00	458.56	464.12	463.57	464.68	0.008758	6.83	143.23	89.10	0.69
ALSPAUGH	88	EX-5YR	1325.00	458.56	464.77	464.54	465.60	0.011919	8.53	198.97	118.61	0.82
ALSPAUGH	88	EX-10YR	1665.00	458.56	465.16	464.96	466.09	0.012772	9.16	238.43	139.18	0.85
ALSPAUGH	88	EX-25YR	2060.00	458.56	465.63	465.53	466.55	0.012305	9.41	310.75	226.55	0.85
ALSPAUGH	88	EX-50YR	2630.00	458.56	466.18	466.18	467.02	0.011231	9.51	440.60	306.51	0.82
ALSPAUGH	88	EX-100YR	3180.00	458.56	466.74	466.74	467.37	0.008781	8.86	669.88	554.05	0.73
ALSPAUGH	88	EX-500YR	4960.00	458.56	467.32	467.32	467.96	0.009439	9.60	1003.15	691.65	0.77
ALSPAUGH	88	ULT-100YR	3270.00	458.56	466.81	466.81	467.41	0.008375	8.71	706.60	568.80	0.72

Appendix D

Storm Drain Model Output for Alspaugh Branch Watershed

Appendix E.1

Roadway Crossing Evaluation for Alspaugh Branch (Y#0948)

AECOM

Robinson Road Crossing

The Robinson Road crossing is approximately 2,000 feet downstream of the Lakewood pond outfall. The crossing consists of 2-6'x6' box culverts that are in good condition. Based on AECOM's HEC-RAS modeling, the Robinson Road crossing will be overtopped by the existing conditions 25-year storm event. This portion of Alspaugh Branch is natural channel, and there appears to be no major erosive issues near the crossing. A 60-inch reinforced concrete pipe (RCP) collects runoff along Robinson Road to the north and discharges into Alspaugh Branch on the downstream face of the culverts.

Robinson Rd Crossing: Looking Downstream

Robinson Rd Crossing: Looking Upstream

Robinson Rd Crossing: Downstream Face

Robinson Rd Crossing: Upstream Face

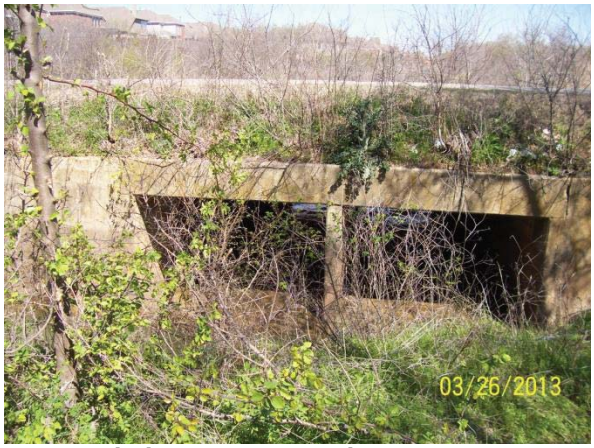
Camp Wisdom Road West Crossing

The Camp Wisdom Road west crossing is approximately 1,000 feet east of the Carrier Parkway/Camp Wisdom Road intersection. The crossing consists of 2-8'x5' box culverts that are in good condition. Based on AECOM's HEC-RAS modeling, the Camp Wisdom Road west crossing will be overtopped by the existing conditions 5-year storm event. This portion of Alspaugh Branch is a natural channel and there appears to be no major erosive issues near the crossing.

Camp Wisdom West Crossing: Looking DS

Camp Wisdom West Crossing: Looking US

Camp Wisdom West Crossing: Downstream Face



Camp Wisdom West Crossing: Upstream Face

Camp Wisdom Road East Crossing

The Camp Wisdom Road east crossing is approximately 2,300 feet northeast of the Camp Widsdom Road West Crossing. The crossing consists of 2-7'x6' box culverts that are in good condition. Based on AECOM's HEC-RAS modeling, the Camp Wisdom Road west crossing will be overtopped by the existing conditions 5-year storm event. This portion of Alspaugh Branch is a natural channel, and there appears to be no major erosive issues near the crossing.

Camp Wisdom East Crossing: Looking DS

Camp Wisdom East Crossing: Looking US

Camp Wisdom East Crossing: Downstream Face

Camp Wisdom East Crossing: Upstream Face

Appendix E.2

QA/QC Response to Comments for Alspaugh Branch (Y#0948)

Detailed Analysis
Hydraulics QA/QC Checklist

Stream Name: Alspaugh Branch

Modeler's Name: Randy Haney

Reviewer's Name: Todd Hyden

QA/QC Folder Path: _____

<Data not in the ArcMAP Project File should be found in the QA/QC Folder.>

SUBMITTED ITEMS:

HEC-RAS Project File Path:

_____

HEC-RAS Multiple Profile Plan Name:

_____

HEC- RAS Floodway Plan Name:

_____

ArcMAP Project File Path:

_____

<Data submitted for each milestone should be carried through each subsequent milestone.>

MILESTONE I: Cross Section Layout

- ☐ GeoRAS geodatabase
- ☒ Study stream centerlines
- ☒ Topographic data
- ☒ Imagery
- ☐ Q3 or current floodplains
- ☒ Watershed location
- ☐ Any previous study work maps
- ☐ Road network for names

MILESTONE II: RAS Geometry

- ☐ Flowpaths
- ☐ Field survey data _____
- ☐ Bridge record plans _____
- ☐ Stationing assumptions and calculations _____
- ☐ Manning's n-values assumptions _____

MILESTONE III: HEC-RAS Model

- ☐ Preliminary floodplain runs
- ☐ Discharge points locations
- ☐ N-values shapefile
- ☐ Check RAS output _____
- ☐ N-value table _____
- ☐ Any record plans needed _____
- ☐ Descriptions of assumptions _____
- ☐ Descriptions of special situations _____

MILESTONE IV: Floodway Model ☐ Included ☐ Not included

- ☐ Floodway points
- ☐ Floodway lines

I. CROSS SECTION LAYOUT:

Modeler's Initials:	RH	Date Submitted:	2/14/13
Reviewer's Initials:	TH	Date Reviewed:	2/27/13
Modeler's Initials:	RH	Date Responded:	3/4/13

TECHNICAL REVIEW:

- ☐ Cross sections extend to assumed limits of floodplains
- ☒ Reasonably perpendicular to flow
- ☐ Reasonable location of the 4 bridge cross section
- ☒ Reasonable spacing between cross sections
- ☐ Reasonable transitions, constrictions, and expansion on floodplain

REVIEW COMMENTS:

1. Cross sections will need to be extended to ensure containment of 500 year flows if current cross sections do not contain.
2. Please name the cross sections in the shapefile for ease of reference.
3. Please ensure that the 7 most downstream cross sections are extended across the 500 year floodplain for Alspaugh Creek.

Note: All numbering of cross sections below is from the downstream end of the stream centerline unless otherwise noted. The shapefile can be referred to as guidance for all comments except for #14.

4. Consider extending the left overbank for the 7th cross section.
5. Revise the 10th cross section.
6. Straighten the bend in the left overbank of the 10th cross section.
7. Extend the 15th cross section.
8. Extend the left overbank of the 17th cross section.
9. Extend the right overbank of the 21st cross section based on the comments shapefile provided.
10. Straighten the 24th cross section.
11. Realign the 25th cross section based on the comments shapefile provided.
12. Place an additional cross section upstream of the 32nd cross section.
13. Extend the right overbank of the 35th cross section (not including the added cross section).
14. The cross sections upstream and downstream of the bounding cross sections for Robinson Road appear to be very close to the bounding cross sections. Please allow more distance between these cross sections and the bounding cross sections.
15. Shorten the left overbank of the 2nd cross section downstream from the upstream end of the stream centerline based on the comments shapefile provided.

RESPONSE TO COMMENTS:

1. Cross Sections have been extended where appropriate.
2. Cross Sections have been named according to stationing.
3. This area has been modified. Flow will likely be lost to another watershed over the left bank.
4. Left overbank extends to the edge of the Alspaugh watershed. Flow that overtops the ridge will be lost from the system.
5. Revised.
6. This XS has been updated
7. Agree- extended
8. Agree- extended

9. Agree- this area has been modified. All XS's extend to the road.
10. Revised
11. Revised
12. XS added
13. Revised
14. Agree- Revised XS's
15. Revised

II. RAS GEOMETRY:

Modeler's Initials:	RH	Date Submitted:	6-5-13
Reviewer's Initials:	TH	Date Reviewed:	06/11/2013
Modeler's Initials:	RH	Date Responded:	6-24-13

TECHNICAL REVIEW:

- ☐ Top of bank at reasonable locations
- ☐ Bridge Geometry Corresponds to Surveys or Record Plans
- ☐ Bridge Geometry assumptions documented
- ☐ Contraction and expansion coefficients
- ☐ Proper use of Ineffective flow areas
- ☐ Reasonable Manning's n-values
- ☐ No Crossing profiles

REVIEW COMMENTS:

1. Consider moving bank stations above the 2 year flow but below the 10-year flow, and maintaining bank station slope from station to station that reflects ground slope.
2. Consider lowering left bank station to be more in line with right bank station for cross section 2587.
3. Consider lowing bank stations at cross section 3141 to be in line with 3040 and 3234.
4. There is a reach length discrepancy in the model. This is shown when you select XS 11471 in the profile plot and the station given is 11117. These numbers should match. This indicates that the reach lengths at one or more cross sections are shorter than the actual distance along the channel - or that the cross sections need to be renamed to reflect the actual distance along the stream centerline.
5. Consider lowing bank stations near the 2 year flow for cross section 6989.
6. Consider lowering right bank station to be in line with left bank station near the 2 year flow.
7. Consider moving the right bank station for 659 to station 2357.47 and placing a right hand ineffective flow area at that point.
8. Consider placing a right hand ineffective flow area at station 1641.03 for cross section 88.
9. Consider placing a right hand ineffective flow area at station 390.99 for cross section 1976.
10. What does the right ineffective flow for cross section 3234 represent?
11. Consider changing the ineffective flow area height for cross section 4161 to be at the elevation halfway between the top of the culvert and the lowest point in the deck.
12. Please extend cross section 7797 to contain the 500 year flow.
13. Please provide reasoning for elevation of ineffective flow area on cross section 9451.
14. The upstream internal cross section for structure 9506 does not match cross section 9548 and does not contain the 100 year flows and the 500 year flows. Please extend the internal cross section or match the US bounding cross section to contain flows.
15. Please extend the left overbank of cross section 10027 to contain the 500 year flow.
16. For cross section 11471 consider placing left ineffective flows at stations 98.43, 176.25, and 264.36. Consider placing right ineffective flows at 455.58, and 597.79.
17. For cross section 11354 consider placing a left ineffective flow area at station 153.73. Also, consider placing right ineffective flows at stations 353.97, and 555.53.
18.

RESPONSE TO COMMENTS:

1. Bank stations were taken from survey points, where available. This is typically under the 2-year storm event for this model.
2. This bank station came from survey.
3. The current bank stations reflect the channel geometry.
4. Reach lengths corrected, however when you select the profile plot, the XS will not match the station given due to the difference in the most DS XS and the beginning of the stream CL.
5. The current bank stations reflect the channel geometry.
6. Which XS is this referring to?
7. Bank station adjusted. Ineffective added.
8. Ineffective added
9. Ineffective added
10. This area is ineffective because of the sudden widening of the overbanks on the right side of the channel. If you look at the contours around this area you can see how the area is ineffective.
11. Ineffectives are set at the top of the culvert. Left as-is.
12. This XS is currently truncated at the high point before the drop off for the pond.
13. XS 9451 ineffectives are set at the top of the culvert opening. Adjusted 9410 to the same.
14. Internal XS extended
15. 500yr is currently contained by the left overbank.
16. Ineffectives added
17. Ineffectives added

III. HEC-RAS MODEL REVIEW:

Modeler's Initials:	_____	Date Submitted:	_____
Reviewer's Initials:	TH	Date Reviewed:	8/28/2013
Modeler's Initials:	_____	Date Responded:	_____

TECHNICAL REVIEW:

- ☐ Discharge locations and values are appropriate and reasonable
- ☐ Starting boundary conditions are reasonable
- ☐ Cross section geometry extends to limits of floodplain
- ☐ Manning's n values are reasonable
- ☐ Contraction and expansion coefficients are appropriate
- ☐ Ineffective flow top widths
- ☐ Bridge and culvert layouts are complete and correctly placed
- ☐ Special feature (weir, overflow, split flow) layouts are complete and correctly placed
- ☐ Profiles do not cross
- ☐ Check-RAS has been run
- ☐ Errors, warnings, and special notes have been addressed

REVIEW COMMENTS:

1. No comments.
2.
3.
4.

RESPONSE TO COMMENTS:

1.
2.
3.
4.

IV. FLOODWAY MODEL:

Modeler's Initials:	_____	Date Submitted:	_____
Reviewer's Initials:	TH	Date Reviewed:	9/15/2013
Modeler's Initials:	_____	Date Responded:	_____

TECHNICAL REVIEW:

- ☐ Discharge consistent with multiple profile plan
- ☐ Surcharges between 0 and max allowed
- ☐ Check starting boundary conditions with friction slope
- ☐ Negative surcharges

REVIEW COMMENTS:

1. No comments.
2.
3.
4.

RESPONSE TO COMMENTS:

1.
2.
3.
4.

QA/QC APPROVAL:

This Detailed Analysis Hydraulics QC review is in compliance with the contract requirements and all task "check points" are complete. The independent QC team has reviewed the hydraulic analysis, presented QC comments to the production team, and discussed any problems or issues. Task production managers have signed the QC document to confirm that all comments are received, addressed, and documented appropriately.

Production Team Manager	1/31/2014 Date
QC Team Manager	1/31/2014 Date
Project Manager	1/31/2014 Date

Detailed Analysis
Hydrology QA/QC Checklist

Watershed Name: Alspaugh Branch

Streams in Analysis: Alspaugh Branch

Modeler's Name: Randy Haney

Reviewer's Name: Todd Hyden

QA/QC Folder Path: I:\29000s\29283\HH\Alspaugh
<Data not in the ArcMAP Project File should be found in the QA/QC Folder.>

SUBMITTED ITEMS:

HEC-HMS Project File Path:

_____

ArcMAP Project File Path:

_____

<Data submitted for each milestone should be carried through each subsequent milestone.>

MILESTONE I: Watershed Delineation

- ☒ Study stream centerlines
- ☒ Topographic data
- ☒ Imagery
- ☒ Drainage area boundaries
- ☐ Any previous study work maps
- ☒ Road network for names
- ☐ Drainage area comparison _____
- ☐ Descriptions of modeler's assumptions _____
- ☐ Descriptions of modeler's notes _____
- ☐ Descriptions of modeler's special situations _____

MILESTONE II: Skeleton Model

- ☐ Existing land use
- ☐ Future land use
- ☐ Flowpaths
- ☐ Soils
- ☐ Loss rate computations _____
- ☐ T_C / Lag Time computations _____

MILESTONE III: Flood Routing

- ☐ Data sources _____
- ☐ Hydraulic models _____
- ☐ Record plans _____

MILESTONE IV: Final Model

- ☐ Calibration _____
- ☐ Frequency Analysis _____
- ☐ Table of Discharges _____
- ☐ Comparison of Discharges _____

I. WATERSHED DELINEATION:

Modeler's Initials:	RH	Date Submitted:	2/14/13
Reviewer's Initials:	TH	Date Reviewed:	2/28/13
Modeler's Initials:	RH	Date Responded:	3/4/13

STATISTICAL DATA:

Total Drainage Area (Ac / mi^2):	1065.88 Ac / mi^2
Total No. of Sub-Basins:	25
Smallest DA (Ac / mi^2):	10.76 Ac / mi^2
Largest DA (Ac / mi^2):	126.98 Ac / mi^2

TECHNICAL REVIEW:

- ☐ DA breaks at headwater limits of detailed hydraulic study.
- ☐ DA breaks at pertinent locations such as confluences, detention facilities, major highways, gages, etc.
- ☐ DA breaks at location common to current effective if applicable and feasible.
- ☐ Is DA size reasonable for type of study?
- ☐ Do DA boundaries agree with available contours and images?

REVIEW COMMENTS:

1. The subbasin shapefile appear to have had two subbasins' areas divided by 100. The listed area for subbasin A-20, and A-01 is not accurate.
2. Thank you for edge-matching to the Fish Creek Subbasins. In an effect to ensure correct drainage boundaries for the Alspaugh Study please include the area draining to the inlets along Twilight Drive south of Sun Rise Ln in Subbasin A-01.
3. Revise Subbasin A-17 east of the northern intersection of Camp Wisdom Road and Robinson Road so as to not include the inlets draining to the system contained in A-18.
4. Revise Subbasin A-17 where Alspaugh crosses Robinson Road. The drainage area includes some area in the channel downstream of Robinson. Please remove this.
5. Revise Subbasin A-21 at the intersection of Gotland Dr. and Balmoral Ct. The boundary is not perpendicular to contour 521. Please move the boundary closer toward Gotland Dr.

RESPONSE TO COMMENTS:

1. Updated Area totals for all DA's
2. Change made
3. DA's updated. A site visit will be required for this area since the contours do not reflect existing conditions at new roadway.
4. Revised
5. Revised

II. "SKELETON" MODEL:

Modeler's Initials: _____ Date Submitted: _____
Reviewer's Initials: _____ Date Reviewed: _____
Modeler's Initials: _____ Date Responded: _____

STATISTICAL DATA:

Unit Hydrograph Method: _____
Computation Interval: _____
Peaking Factor: _____
Min / Max T_C / Lag: _____ / _____
Loss Rate Method: _____
Min / Max CN: _____ / _____
Min / Max Initial Loss: _____ / _____
Min / Max Uniform Loss: _____ / _____
Rainfall Source: _____
Rainfall Distribution: _____

TECHNICAL REVIEW:

- ☐ Flow paths agree with topography and images, broken down appropriately for sheet flow, shallow concentrated flow, and channel flow
- ☐ Appropriate and consistent Manning's N values for sheet flow and channel flow, per surface conditions
- ☐ Appropriate CN values
- ☐ Peak discharges reasonable compared with previous study(ies) and Rational Method
- ☐ Distribution applicable to study area

REVIEW COMMENTS:

1. Please provide method used to extrapolate percent impervious.
2. The curve number or impervious percent for A-07 appears to be too low due to the presence of the body of water.
3. The percent impervious for A-23 appears to be high. Please provide rationale.
4. Please provide rationale behind subbasin area changing between existing and ultimate conditions.
5. Please provide rational for the curve number decrease from existing conditions to ultimate conditions.
6. Please provide rationale for setting percent impervious at 60 for all subbasins.
7. The lag time in the calculation spreadsheet does not match the HMS model for A-12.
8. Please explain rationale behind there being only one subbasin 18 in the ultimate conditions rather than two subbasins in the existing conditions.
9.

RESPONSE TO COMMENTS:

1. Percent Impervious was calculated in ArcMap by assigning a percent impervious to each parcel, based on type of property and size, and adding the weighted average for each parcel and the roadway areas to get the final percent impervious for each drainage area.
2. A-07 is approximately 40% water. The remaining 60% is open land with a very low percent impervious with no roadways.
3. Nearly 25% of DA-23 is roadway (assumed 98%imp) the average %imp for the remainder of the DA is approx 20% (about half is vacant land and half residential).

4. Ultimate conditions have not been analyzed yet. %Impervious will be updated for ultimate conditions after approval of existing conditions hydrology and hydraulics. Currently the ultimate conditions basin model is a place-holder in HMS.
5. Ultimate conditions have not been analyzed yet. CN's will be updated for ultimate conditions after approval of existing conditions hydrology and hydraulics. Currently the ultimate conditions basin model is a place-holder in HMS.
6. Ultimate conditions have not been analyzed yet. %Impervious will be updated for ultimate conditions after approval of existing conditions hydrology and hydraulics. Currently the ultimate conditions basin model is a place-holder in HMS.
7. This has been updated in the spreadsheet.
8. Ultimate conditions have not been analyzed yet. Drainage Areas will be updated for ultimate conditions after approval of existing conditions hydrology and hydraulics. Currently the ultimate conditions basin model is a place-holder in HMS.

III. FLOOD ROUTING:

Modeler's Initials:	RH	Date Submitted:	6-5-13
Reviewer's Initials:	TH	Date Reviewed:	6/18/2013
Modeler's Initials:	RH	Date Responded:	6-24-13

STATISTICAL DATA:

Routing Method(s):
Channel/Floodplain Storage: _____
Detention Routing: _____

TECHNICAL REVIEW:

☐ Routing method consistent with calculation interval
☐ Stability of hydrographs

REVIEW COMMENTS:

1. Please provide routing reach between junction 12 and 13 for the most downstream portion of Alspaugh. This is shown as Reach 14 in the preliminary models.
2. Please range of cross sections for each reach in the description box for each reach in HMS.
3. The subreach for "Reach-13" in the HMS model is 1, however the calculation spreadsheet indicates it should be 2. Please revise.
4. The excel file, "HMS2RAS-EX-ModPuls", showing where each flow is placed has the flow from "Junction-04" placed at cross section 11501, which does not exist. However the model shows the flow placed at cross section 11471. Please revise the spreadsheet.
5. Similar comment to #4 – Update location of flow for "Junction-07B". 9464 does not exist.
6. Similar comment to #4 – Update location of flow for "Junction-08B". 8460 does not exist in the HEC-RAS model.
7. Similar comment to #4 – Update location of flow for "Junction-10". 4131 does not exist in the HEC-RAS model.
8. Similar comment to #4 – Update location of flow for "Junction-10". 92 does not exist in the HEC-RAS model.
9.

RESPONSE TO COMMENTS:

1. Routing between Junctions 12 and 13 were removed because of the backwater effects from Mountain Creek. Mountain Creek BFEs control WSELs approximately 1000 feet upstream of Camp Wisdom Road; therefore, no channel routing was considered for this area.
2. Descriptions added
3. The 'RAS2HMS – ModPuls' spreadsheets indicates "Reach-13" the number of subreaches is 1. The HMS model was at 2 and has now been revised to 1.
4. XS names updated in excel.
5. See Response 4.
6. See Response 4.
7. See Response 4.
8. See Response 4.

IV. FINAL MODEL:

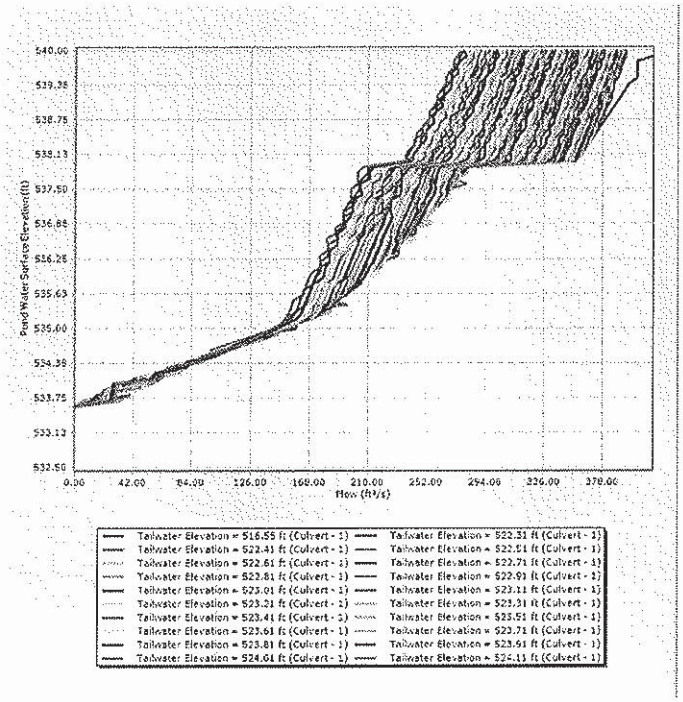
Modeler's Initials:	RH	Date Submitted:	6-5-13
Reviewer's Initials:	TH/JMY	Date Reviewed:	6/17/2013
Modeler's Initials:	RH	Date Responded:	6-24-13

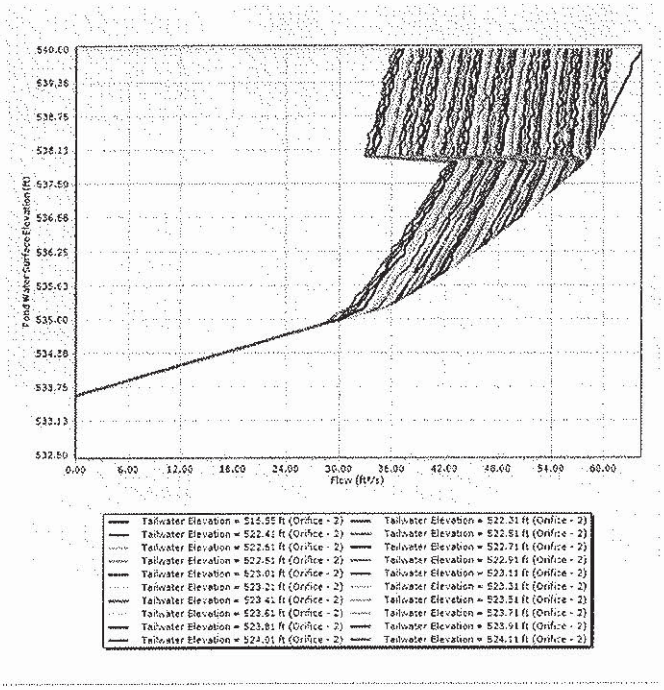
TECHNICAL REVIEW:

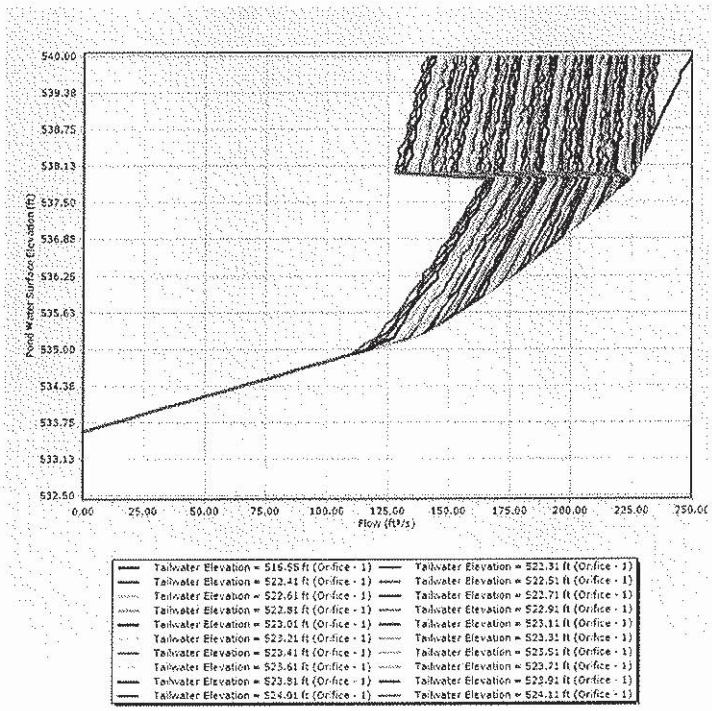
- ☐ Discharges are reasonable for drainage area sizes
- ☐ Comparison to flood warning gages

REVIEW COMMENTS:

1. Areas in subbasin shapefiles match areas in HMS model, but do not match some areas in PondPack. Please revise areas in PondPack model to reflect the areas calculated in GIS. Please round to the hundreths.
2. Please extend longest flowpaths to the edge of the subbasins for: A-08, A-13, A-14, A-15, A-16, and A-18A.
3. Subbasin A-23 should be contained within the subbasin.
4. Please explain the difference between 11-A and 11-B in the summary page of the Tc calculation spreadsheet.
5. We recommend revising time of concentration calculations to have a minimum slope of 0.005.
6. For subbasins A-12 and A-20, the flowpath in the ditch along Ranch Rd and Camp Wisdom Road should be considered channel flow rather than shallow concentrated. Please revise.
7. Based on the most recent Google Maps images the development south of the corner of Camp Wisdom and Bee Drive, and along St. Augustine lane, has been finished out. Please update the flowpath in subbasin A-09 to flow along St. Augustine and enter into the storm drain inlets along St. Augustine.
8. Pond Pack
9. The higher contours through Pond 20 should not be arbitrarily rounded off. All contours should be cut off along the wier spill line east of Matthews Road as shown on the provided exhibit.
10. Recommend using a 6X5 out of box Pond 10 since it will control capacity at the upstream end.
11. Remove Composite Outlet Structures not in use.
12. Recommend switching tailwater type on Outlet 2 to Interconnected Ponds with a range that span the elevations from the RAS rating curve. Then switch Boundary Condition on Out 10 to Elevation Flow Curve.
13. Explain the irregularity of rating curves for parts of Outlet 4 (below).





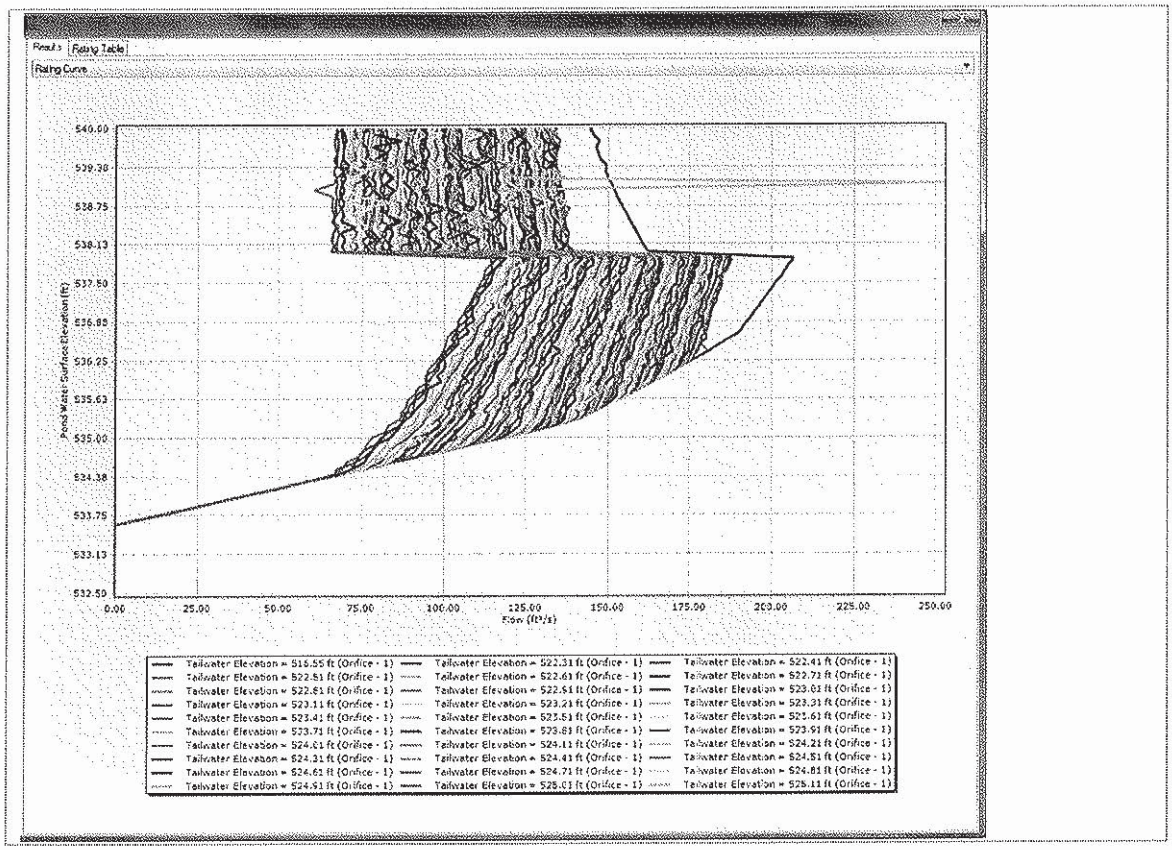


RESPONSE TO COMMENTS:

1. PondPack areas updated.
2. TC lines updated, however they do not touch DA boundaries because Overland flow should not exceed 100 ft for urban areas.
3. TC line updated
4. See attached Tc spreadsheet. A-11A was combined with A-12 based on previous comments. We did not provide Tc spreadsheet for this review.
5. Slopes updated.

6. For Ranch Road, we performed a site visit and determined that the 'ditches' on the sides of the road did not warrant channel flow. Very few driveways have functional cross-drainage. Shallow concentrated flow is more accurate in this area where depths of flow may not exceed 2-3 inches during a storm event.
7. Left this Tc line as-is. Since 2009 City of GP aerials and contours were used in the delineation and Tc lines, we want to stay consistent with the sources used. Utlimate conditions can be updated to reflect this change.
8. PondPack
9. Contours and areas updated.
10. Changed to 6x5 as per Halff's request; however, the size of the inlet at Pond 10 is the controlling factor and not the 6x5 (upstream pipe) or 9x5 (downstream pipe). Since backwater from Pond 20 controls on the downstream side while the inlet at Pond 10 controls on the upstream side, there were very slight changes in flow and pond elevations when the switch was made.
11. Unused info removed
12. Left as-is. When using the recommended method the model went unstable on the back end flow curve. Both methods result in similar peak flows and peak times.
13. Irregularities occur at elevation 538 which is the elevation of the weir that separates Orifice1/Orifice2 from Riser1. Pond 10 has two sets of inlets – 1 primary (Orifice1/Orifice2) and 1 secondary (Riser1) that are hydraulically separated by a weir at elevation 538. At elevation 538, the flow capacity of the 6x5 culvert is divided over these two inlets (instead of one inlet at the preceding elevation of 537.90) and there is a marked drop in the flow entering Orifice1/Orifice2 (as seen in the curves). The distribution of flow over the two inlets changes from all flow in Orifice1/Orifice2 and no flow in Riser1 at elevation 537.90 to lower flows in Orifice1/Orifice2 and some flow in Riser1 in 538.00; however, cumulatively the total flow entering the 6x5 box increases at elevation 538.

After revisions, to the model based on the comments received from Halff, the following anomaly was found to occur for Orifice1. The sudden spike in the Q occurs at elevation 539.1 when the tailwater in Pond20 is at 525.31 feet. This seems to be an internal bug in PondPack that causes a significant error in downstream tailwater calculations (>10%). After review of the results, this bug does not seem to affect the flow entering Pond20 from Pond10.


Results
Rating Table
Rating Curve
Pond Water Surface Elevation (ft)
540.00
539.38
538.75
538.13
537.50
536.88
536.25
535.63
535.00
534.38
533.75
533.13
532.50
0.00
25.00
50.00
75.00
100.00
125.00
150.00
175.00
200.00
225.00
250.00
Flow (ft^3/s)
Tailwater Elevation = 515.55 ft (Orifice - 1)
Tailwater Elevation = 522.31 ft (Orifice - 1)
Tailwater Elevation = 522.41 ft (Orifice - 1)
Tailwater Elevation = 522.51 ft (Orifice - 1)
Tailwater Elevation = 522.61 ft (Orifice - 1)
Tailwater Elevation = 522.71 ft (Orifice - 1)
Tailwater Elevation = 522.81 ft (Orifice - 1)
Tailwater Elevation = 522.91 ft (Orifice - 1)
Tailwater Elevation = 523.01 ft (Orifice - 1)
Tailwater Elevation = 523.11 ft (Orifice - 1)
Tailwater Elevation = 523.21 ft (Orifice - 1)
Tailwater Elevation = 523.31 ft (Orifice - 1)
Tailwater Elevation = 523.41 ft (Orifice - 1)
Tailwater Elevation = 523.51 ft (Orifice - 1)
Tailwater Elevation = 523.61 ft (Orifice - 1)
Tailwater Elevation = 523.71 ft (Orifice - 1)
Tailwater Elevation = 523.81 ft (Orifice - 1)
Tailwater Elevation = 523.91 ft (Orifice - 1)
Tailwater Elevation = 524.01 ft (Orifice - 1)
Tailwater Elevation = 524.11 ft (Orifice - 1)
Tailwater Elevation = 524.21 ft (Orifice - 1)
Tailwater Elevation = 524.31 ft (Orifice - 1)
Tailwater Elevation = 524.41 ft (Orifice - 1)
Tailwater Elevation = 524.51 ft (Orifice - 1)
Tailwater Elevation = 524.61 ft (Orifice - 1)
Tailwater Elevation = 524.71 ft (Orifice - 1)
Tailwater Elevation = 524.81 ft (Orifice - 1)
Tailwater Elevation = 524.91 ft (Orifice - 1)
Tailwater Elevation = 525.01 ft (Orifice - 1)
Tailwater Elevation = 525.11 ft (Orifice - 1)

QA/QC APPROVAL:

This Detailed Analysis Hydrology QC review is in compliance with the contract requirements and all task "check points" are complete. The independent QC team has reviewed the hydrologic analysis, presented QC comments to the production team, and discussed any problems or issues. Task production managers have signed the QC document to confirm that all comments are received, addressed, and documented appropriately.

Production Team Manager	1/31/2014 Date
QC Team Manager	1/31/2014 Date
Project Manager	1/31/2014 Date

Detailed Analysis
Floodplain Mapping and Profile QA/QC Checklist

Stream Name: Alspaugh Branch

Mapper's Name: AECOM

Profiler's Name: _____

Reviewer's Name: Angela Wright

SUBMITTED ITEMS:

ArcMAP Project File Path:

_____

<Data submitted for each milestone should be carried through each subsequent milestone.>

MILESTONE I: Floodplain Mapping

- ☐ Study stream centerlines
- ☐ Floodplains
- ☐ Cross sections
- ☐ Cross section boundary polygon
- ☐ Topographic data
- ☐ Imagery
- ☐ Ground surface DTM
- ☐ Water surface DTM
- ☐ Watershed location
- ☐ Q3 or current floodplains
- ☐ Road network for names

MILESTONE II: Floodplain Boundary Standard Audit

- ☐ FBS points
- ☐ FBS regions

MILESTONE III: Floodway ☐ Included ☐ Not included

- ☐ Floodway

MILESTONE IV: Base Flood Elevations ☐ Included ☐ Not included

- ☐ BFEs

MILESTONE V: Profile

PROJECTION SYSTEM:

Projection: _____
Zone or FIPSZone: _____
Horizontal Datum: _____
Horizontal Units: _____
Vertical Datum: _____
Vertical Units: _____

☐ All layers have the same defined projection system

I. FLOODPLAIN MAPPING:

Mapper's Initials: _____ Date Submitted: _____
Reviewer's Initials: ALW Date Reviewed: 9/3/13
Mapper's Initials: AMS Date Responded: 9/16/13

FLOODPLAIN DATA FORMAT:

- ☐ Geodatabase
- ☒ Shapefile
- ☐ Coverage

FLOODPLAIN DELINEATION METHOD:

- ☐ Raster intersection
- ☒ TIN intersection
- ☒ Other: Geo-RAS

TECHNICAL REVIEW:

- ☒ Floodplain delineation appears to agree with DTM/Contours
- ☒ 1% chance (100-yr) top widths match between RAS model and mapping
- ☒ Zone AE backwater mapped for unstudied tributaries
- ☐ Zone A delineations beyond limits of detailed study
- ☒ Floodplain delineations are reasonably smooth, based on final scale
- ☒ Cross sections extend beyond 0.2% chance (500-yr) floodplain
- ☒ Stream centerline is contained within the floodplain
- ☒ Water bodies (pond, lakes, etc.) are contained within the flood zone
- ☐ If areas of shallow flooding exist, have they been identified (zone and elevation)
- ☐ Floodplain delineation ties in with existing floodplains (if applicable)

REVIEW COMMENTS:

1. XS 1174 right overbank – The floodplain edge is at 472.5 and the floodplain width this approximately 100' wider than the width in HEC-RAS. Check the cross section geometry and floodplain.
2. XS 2587 – Floodplain width measured in GIS is 48' and HEC-RAS has 98'. Check the cross section geometry and floodplain.
3. Floodplain between 11471 and 11354 (along Othen Dr) on left overbank floodplain seems to have hit the edge of the TIN and may need to extended.
4. 500-year floodplain not contained in XS 10679, 10027, 8731, 7986, 7797, 7012, 4211.
5.

RESPONSE TO COMMENTS:

1. There is high ground in the left overbank. This area was removed due to the size of this area compared to the entire section. The FW width in the FDT matches the FW width that was map as according to Appendix C of the Guidelines and Specifications.
2. Floodplain boundary revised.
3. Cross sections extended. Mapping only includes backwater since the "street" flooding is a completely separate system.
4. Cross sections extended.

II. FLOODPLAIN BOUNDARY STANDARD AUDIT:

Mapper's Initials: RH Date Submitted: 9/15/2013
Reviewer's Initials: TH Date Reviewed: 9/31/2013
Mapper's Initials: _____ Date Responded: _____

COMMUNITY RISK CLASSIFICATION (CHOOSE HIGHEST RISK CLASS FOR AREA):

	Risk Class	Characteristics	Delineation Reliability of the floodplain boundary per study methodology
☐	A	High population and densities within the floodplain, and/or high anticipated growth	+/- 1.0 foot / 95%
☐	B	Medium population and densities within the floodplain, and/or modest anticipated growth	+/- 1.0 foot / 90%
☐	C	Low population and densities within the floodplain, small or no anticipate growth	+/- 1.0 foot / 85%
☐	D	Undetermined Risk, likely subject to flooding	NA
☐	E	Minimal risk of flooding; area not studied	NA

FBS AUDIT REPORT:

a.	Number of Floodplain Boundary Points Audited:		367
b.	Number of Exception Points along Unmerged Floodplain:		121
c.	Total Valid Floodplain Boundary Points Audited:	(a-b)	246
d.	Number of Valid Floodplain Boundary Points Passed:		232
e.	Number of Valid Floodplain Boundary Points Failed:		14
f.	Overall Pass/Fail for Study Audit Risk Classes:	(d/c)x100	94.3 % Pass
		(e/c)x100	5.7 % Fail

REVIEW COMMENTS:

1. No comments.
2.
3.
4.

RESPONSE TO COMMENTS:

1.
2.
3.
4.

III. FLOODWAY:

Mapper's Initials:	_____	Date Submitted:	_____
Reviewer's Initials:	ALW	Date Reviewed:	9/3/13
Mapper's Initials:	AMS	Date Responded:	9/16/13

TECHNICAL REVIEW:

Included in study: ☒ Yes ☐ No
Source of data: ☒ HEC-RAS model ☐ Digitized from existing

- ☒ Floodway does not extend beyond limits of detailed study (1% chance floodplain)
- ☒ Floodway lines are reasonably smooth
- ☒ Floodway is contained within the 1% change (100-yr) floodplain
- ☒ If floodway currently exists, does new floodway reasonably match effective floodway
- ☒ Floodway top widths match between RAS model and mapping
- ☒ Floodway ties in to other floodways at downstream end (if applicable)
- ☒ Floodway mapped correctly at structures

REVIEW COMMENTS:

1. XS 7797 – Floodway width in RAS is 167 and GIS measures 108
2.
3.
4.

RESPONSE TO COMMENTS:

1. FW modified
2.
3.
4.

IV. BASE FLOOD ELEVATIONS:

Mapper's Initials:	_____	Date Submitted:	_____
Reviewer's Initials:	alw	Date Reviewed:	9/3/13
Mapper's Initials:	SDS	Date Responded:	9/16/13

TECHNICAL REVIEW:

- ☒ BFEs are reasonably perpendicular to 1% chance (100-yr) flow
- ☒ BFEs are reasonably straight lines
- ☒ BFEs reproduce the profile within 0.5 feet
- ☒ BFEs do not intersect with cross sections
- ☒ BFEs are attributed with elevation
- ☒ BFEs cross the entire 1% chance floodplain (no under or over shoots)
- ☒ If 'islands' exist in 1% chance floodplain, segments of BFEs have been deleted
- ☒ BFEs have been place upstream and downstream of structures

REVIEW COMMENTS:

1. Remove BFE 471 on the upstream of E Camp Wisdom Rd at XS 1124.
2. Add BFE between XS 1667 to 1174. BFE 474 should be at approximately 1424. Based on the FEMA BFE guidelines for a steep gradient
3. BFE 479, 482 can be removed based on FEMA BFE guidelines for a moderate gradient.
4. Remove BFE 487 at XS 3040. This BFE is the location of the slope change on the profile
5. Remove BFE 491 at XS 3726 based on the FEMA BFE guidelines for a gentle gradient. Also remove BFE 498 downstream of XS 4211.
6. Add BFE 502 between XS 5732 and 6569 at station 6150
7. Remove BFE 516 at XS 7797 and add BFE 515 at XS 7611
8. Add BFE 518 near station 9150
9. Remove BFE 526 near XS 9548
10. BFE 526 located 23' upstream of XS 9451. I think this should be BFE 525 based on the profile and HEC-RAS
11. Extend BFE 485, 530 to snap to the edge of the floodplain
12. Should BFEs downstream of XS 1174 be removed? The current effective floodplain shows the Mountain Creek effective floodplain starting around XS 1124.

RESPONSE TO COMMENTS:

1. Removed
2. Steep gradient guidelines were used, which call for a BFE every 500ft (0.5in map distance) or every 5 vertical feet, whichever is greater. The BFEs placed were placed at approximately 500 ft apart, which was the greater of the two options in this case.
3. These BFEs were placed at inflection points per the BFE guidance and not to meet the intermediate BFE placement guidance. However, if the assumption is that the only significant breaks (inflection points) are at 477, 480, and 485 (which is reasonable) then the calculated gradient between 477 & 480 is 5.1 and steep. The distance between those BFEs is about 600ft, so the 479 BFE fills in the intermediate requirement. Using the same analysis between 480 & 485, no intermediate is required and so BFE 482 removed as requested. Please let me know if this does not make sense.
4. Not addressed, BFE was placed at an inflection point and without it the linear interpolation between BFEs would differ from the base flood profile by greater than 0.5ft.
5. Removed

6. Current BFE placement meets intermediate BFE placement guidance for moderate slope (if measured between BFE 503 & 499 inflection points) and steep slope (if measured between BFE 508 & 499 inflection points). Additional intermediate BFE not recommended due to the location.
7. This comment not addressed as it would result in linear interpolation between BFE 515 & 516 (at station 7985) that would differ from the base flood profile by greater than 0.5ft.
8. No revision made per this comment, as 518 would not be appropriate at this station. This may have intended to call for the 519 BFE to be moved from 9125 to approximately 9150, please clarify. Note that the 519 BFE was placed at an inflection point.
9. Removed
10. The base flood profile at this location indicates an elevation of 525.56; therefore the 526 BFE was used.
11. Revision made.
12. It appears that the Zone A approximate at the confluence point of Alspaugh with Mountain Creek is at an approximate BFE of 467 – 468. The detailed flood elevations from Alspaugh fall from about 471 to 467 in this reach; therefore while there seems to be a possibility that Mountain Creek backwater could be impacting the mapping, BFEs, and stream profile of Alspaugh at the very downstream end of Alspaugh near XS 88; just upstream of XS 88 it appears that the Alspaugh flooding could be the controlling flood source. However, ultimately this issue should be decided when the final DFIRM database is updated with this new study & mapping and tie-ins to the effective mapping are made.

V. PROFILE:

Profiler's Initials: _____ Date Submitted: _____
Reviewer's Initials: ALW Date Reviewed: 9/3/13
Profiler's Initials: AMS Date Responded: 9/16/13

TECHNICAL REVIEW:

Format of submittal: ☐ Hard Copy ☒ PDF ☐ DWG
Source of data: ☐ Exported from RAS ☐ Digitized from existing

- ☒ All stream profiles show the proper elevations
- ☐ Backwater elevations were calculated by interpolation or visual inspection
- ☒ Lettered cross sections are shown at the proper station
- ☒ Structures are shown at the proper station
- ☐ Bridge high and low chords are shown at the proper elevations
- ☒ Culvert high and low chords are shown at the proper elevations
- ☒ Structure names have been checked against current data
- ☒ Upstream and downstream study limits are labeled
- ☒ All major grid lines are labeled along the border, except the bottom two on the right side
- ☒ Vertical and horizontal datum labels are correct
- ☒ Stream names have been checked against current data
- ☒ The county or community name is correct
- ☐ Profile panels have been ordered in alphabetical order

FORMAT REVIEW:

- ☒ All stream profile formats are consistent throughout all profiles
- ☒ All stream profiles have linetypes generated
- ☒ Streambed profile format is consistent throughout all profiles
- ☐ All bridges are shown as "I-beams"
- ☒ All culverts are shown as solid blocks
- ☐ Backwater notation format and position is consistent throughout all profiles
- ☒ Structure label text is readable and format is consistent throughout all profiles
- ☒ All border text is readable and consistent throughout all profiles
- ☒ Legend entries use the "% Annual Chance Flood" format
- ☒ All other notes are readable and consistent throughout all profiles

REVIEW COMMENTS:

1. Camp Wisdom Road East elevations don't match the HEC-RAS Profile
2.
3.
4.

RESPONSE TO COMMENTS:

1. Camp Wisdom Road East elevations in the profile match the elevations in the HEC-RAS geometry file. The HEC-RAS profile misrepresents the actual deck elevations. No changes made.
2.
3.
4.

QA/QC APPROVAL:

This Detailed Analysis Floodplain Mapping and Profile QC review is in compliance with the contract requirements and all task "check points" are complete. The independent QC team has reviewed the floodplain mapping and profiles, presented QC comments to the production team, and discussed any problems or issues. Task production managers have signed the QC document to confirm that all comments are received, addressed, and documented appropriately.

Production Team Manager	1/31/2014 Date
QC Team Manager	1/31/2014 Date
Project Manager	1/31/2014 Date

DELIVERABLE RELEASE RECORD

1. PROJECT INFORMATION

Project Name: Alspaugh Branch CTP MAS & DMP	Project Number: 60285901
Client: CITY OF GRAND PRAIRIE	
Project Manager: Sukheswalla, Zubin	Project Director: Batker, Nick

2. DELIVERABLE INFORMATION

Deliverable Description: Hydrology and Hydraulic Models	
Submit to: Halff Associates	Submittal Date: 2013-06-05

3. REVIEW LEVEL

☐ Final Submission ☒ Pre-Final Submission ☐ Other: % Submission

4. QUALITY REVIEW RECORD

Record of Discipline Approval (by discipline lead)

Discipline	*Deliverable Components*	*	*Signature*	*Date*
Water	**Drawings**		**Sukheswalla, Zubin**	**2013-06-05**
Comments:	All H&H Model Review is complete. Ready for release externally - ZRS (06/05/2013)			

* Check box to confirm interdiscipline review completed

Signatures above indicate that the deliverable components listed, including work contributing to the deliverable (e.g. calculations), have been:

- Prepared by qualified staff in accordance with generally accepted professional practice
- Checked for completeness and accuracy by approved discipline leads who did not perform the original work
- Compatibility, interfaces and potential conflicts among the involved disciplines have been reviewed and resolved
- Review comments, including any remaining comments from previous internal or external reviews, have been resolved
- Reviewed for conformance to scope and other statutory and regulatory requirements
- Determined suitable for submittal

5. INDEPENDENT PEER REVIEW RECORD (when required)

Signatures below indicate:

- All comments, issues and concerns identified by the independent peer review team have been addressed and resolved.

Discipline	*Deliverable Components*	*Signature*	*Date*
Water	**Drawings**	**Batker, Nick**	**2013-06-05**
Comments:	Comments provided on PondPack, HEC-HMS and HEC-RAS models for Alspaugh Branch for existing conditions. All comments addressed prior to submittal to client.		

DELIVERABLE RELEASE RECORD

6. RELEASE AUTHORIZATION

The full deliverable package has been reviewed for overall completeness, compatibility, and conformance with scope and other contract requirements, all applicable reviews have been completed, and the full deliverable package is ready for submission to the client.

Project Manager:	Sukheswalla, Zubin	Date:	2013-06-05

Project Manager Comments:

Project Quality Representative:	Gaertner, Theodore	Date:	2013-06-06

PQR Comments:

DELIVERABLE RELEASE RECORD

1. PROJECT INFORMATION

Project Name: Alspaugh Branch CTP MAS & DMP	Project Number: 60285901
Client: CITY OF GRAND PRAIRIE	
Project Manager: Sukheswalla, Zubin	Project Director: Batker, Nick

2. DELIVERABLE INFORMATION

Deliverable Description: Existing Conditions Models	
Submit to: Client	Submittal Date: 2013-08-15

3. REVIEW LEVEL

☐ Final Submission ☒ Pre-Final Submission ☐ Other: % Submission

4. QUALITY REVIEW RECORD

Record of Discipline Approval (by discipline lead)

Discipline	*Deliverable Components*	*	*Signature*	*Date*
Water	**Study/Report, Other: Hydraulic Modeling**		**Smith, April**	**2013-08-15**
Comments:	Floodway hydraulic model, mapping and report comments have been addressed.			
Mark-up Documents:	usrnk1fp201\Texas\AlspaughBranch\700_QUALITY_MANAGEMENT\704_Report_Review_Checklists			
Water	**Other: Hydrology**		**Sukheswalla, Zubin**	**2013-08-15**
Comments:	Hydrology Comments are as follows: Drainage Basin/Tc comments - in MXD file (Alspaugh Branch-DAQC-zrs_nrb_xsect.mxd) Other Tc comments - in Excel file (Tc_Calcs_zrs.xlsx) PondPack and HMS Model Comments - none (but external Peer Review performed by Halff Associates as part of Program Mgmt duties)			
Unknown	**Other: External Review**		**Haney, Randy**	**2013-08-15**
Comments:	External comments will be provided at a later date.			
Mark-up Documents:	\\USDAL1FP002\pwp\30931-GrandPrairie\60285901_AlspaughBranchMDP\200 Correspondence Files\201-Incoming Correspondence\201.1 Client\Comments			
Contact Information:	Todd Hyden and Stephen Crawford at Halff and Associates			

* Check box to confirm interdiscipline review completed

Signatures above indicate that the deliverable components listed, including work contributing to the deliverable (e.g. calculations), have been:

- Prepared by qualified staff in accordance with generally accepted professional practice
- Checked for completeness and accuracy by approved discipline leads who did not perform the original work
- Compatibility, interfaces and potential conflicts among the involved disciplines have been reviewed and resolved
- Review comments, including any remaining comments from previous internal or external reviews, have been resolved
- Reviewed for conformance to scope and other statutory and regulatory requirements
- Determined suitable for submittal

DELIVERABLE RELEASE RECORD

5. INDEPENDENT PEER REVIEW RECORD (when required)

Signatures below indicate:

- All comments, issues and concerns identified by the independent peer review team have been addressed and resolved.

Discipline	*Deliverable Components*	*Signature*	*Date*

6. RELEASE AUTHORIZATION

The full deliverable package has been reviewed for overall completeness, compatibility, and conformance with scope and other contract requirements, all applicable reviews have been completed, and the full deliverable package is ready for submission to the client.

Project Manager:	Sukheswalla, Zubin	Date:	2013-08-15
Project Manager Comments:	All QC has been performed. Product is ready for delivery.		
Project Quality Representative:	Gaertner, Theodore	Date:	2013-08-15
PQR Comments:			

DELIVERABLE RELEASE RECORD

1. PROJECT INFORMATION

Project Name: Alspaugh Branch CTP MAS & DMP	Project Number: 60285901
Client: CITY OF GRAND PRAIRIE	
Project Manager: Sukheswalla, Zubin	Project Director: Batker, Nick

2. DELIVERABLE INFORMATION

Deliverable Description: Draft MDP and Proposed Models	
Submit to: City of Grand Prairie	Submittal Date: 2013-11-08

3. REVIEW LEVEL

☐ Final Submission ☒ Pre-Final Submission ☐ Other: % Submission

4. QUALITY REVIEW RECORD

Record of Discipline Approval (by discipline lead)

Discipline	*Deliverable Components*	*	*Signature*	*Date*
Water	**Study/Report**		**Sukheswalla, Zubin**	**2014-04-04**
Comments:	Comments provided in digital format by me and Nick Batker.			
Mark-up Documents:	\\usdal1fp002\pwp\30931-GrandPrairie\60285901_AlspaughBranchMDP\500 Progress Submittal - Deliverabes\502 MDP Report\Draft Report\old\Report_Draft_3-28-14_zrs_nrb.docx			

* Check box to confirm interdiscipline review completed

Signatures above indicate that the deliverable components listed, including work contributing to the deliverable (e.g. calculations), have been:

- Prepared by qualified staff in accordance with generally accepted professional practice
- Checked for completeness and accuracy by approved discipline leads who did not perform the original work
- Compatibility, interfaces and potential conflicts among the involved disciplines have been reviewed and resolved
- Review comments, including any remaining comments from previous internal or external reviews, have been resolved
- Reviewed for conformance to scope and other statutory and regulatory requirements
- Determined suitable for submittal

5. INDEPENDENT PEER REVIEW RECORD (when required)

Signatures below indicate:

- All comments, issues and concerns identified by the independent peer review team have been addressed and resolved.

Discipline	*Deliverable Components*	*Signature*	*Date*
Water	**Study/Report**	**Batker, Nick**	**2014-04-04**
Comments:	Review comments provided to PM on 4/3/14.		

DELIVERABLE RELEASE RECORD

6. RELEASE AUTHORIZATION

The full deliverable package has been reviewed for overall completeness, compatibility, and conformance with scope and other contract requirements, all applicable reviews have been completed, and the full deliverable package is ready for submission to the client.

Project Manager:	Sukheswalla, Zubin	Date:	2014-04-04
Project Manager Comments:	All review completed. All comments addressed. Report ready for release to Client		
Project Quality Representative:	Gaertner, Theodore	Date:	2014-04-04
PQR Comments:			

Appendix F

Elevation Certificates for Alspaugh Branch (Y#0948)

Appendix G

Digital Data (DVD)
for Alspaugh Branch (Y#0948)

AECOM